Aglomerados Estelares

Omega Centauri

Omega Cen logo acima do horizonte

Diâmetro aparente ~ 40arcmin

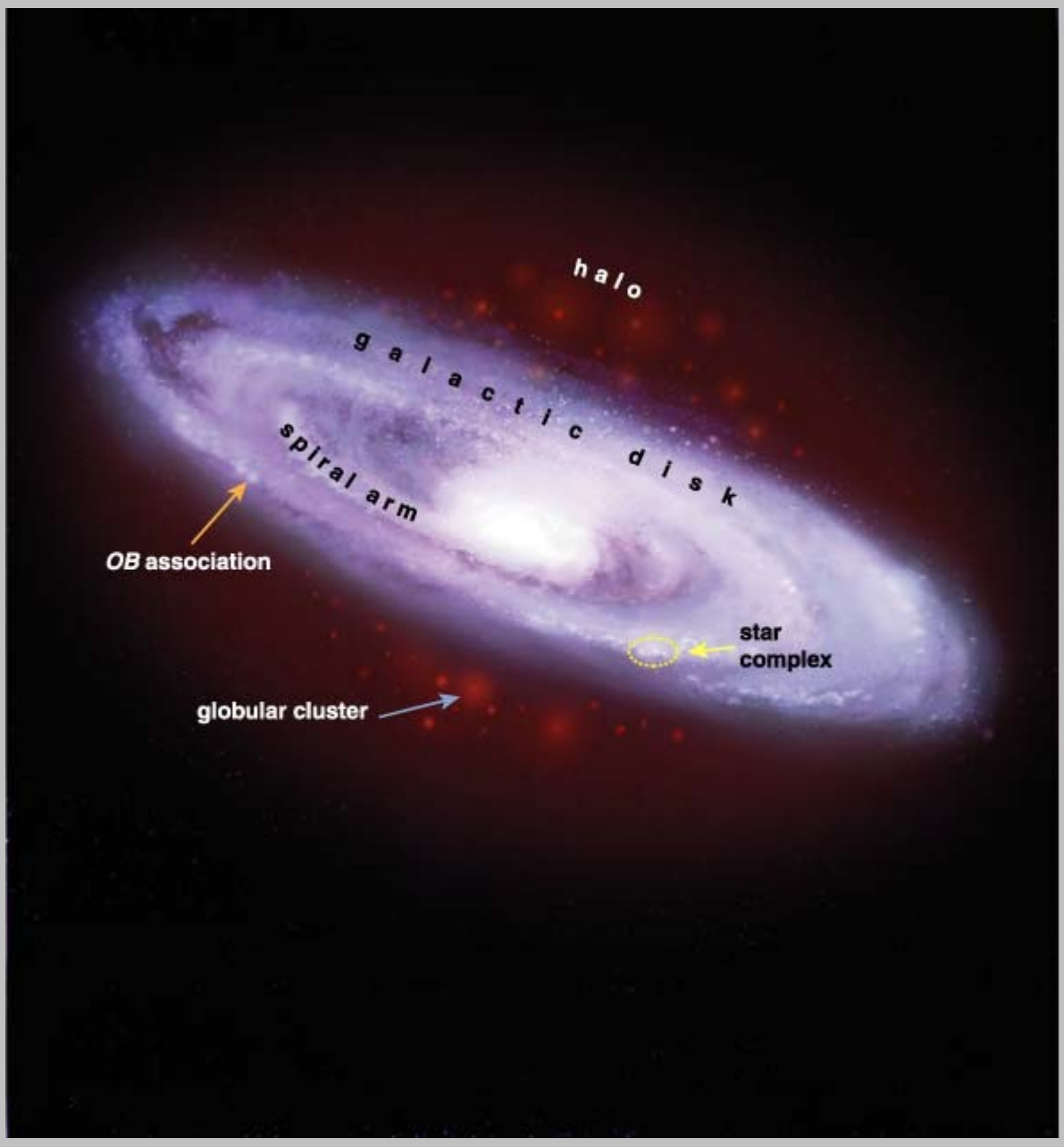
Aglomerados abertos:

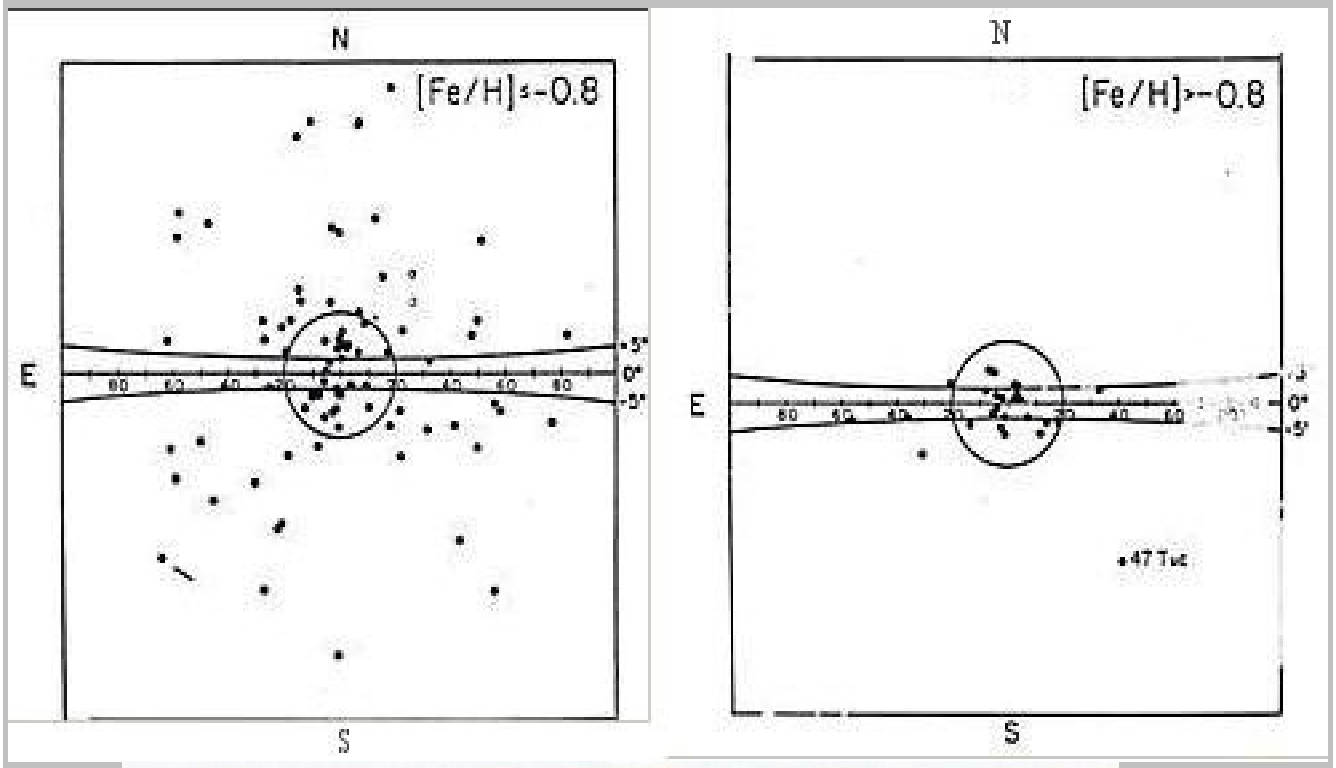
- Dezenas a poucos milhares de estrelas.
- Idades: muito jovens (1 milhão de anos) até relativamente velhos (alguns bilhões de anos).
- Encontram-se em torno do disco da Galáxia.
- Exemplos: Pleiades e Hyades.

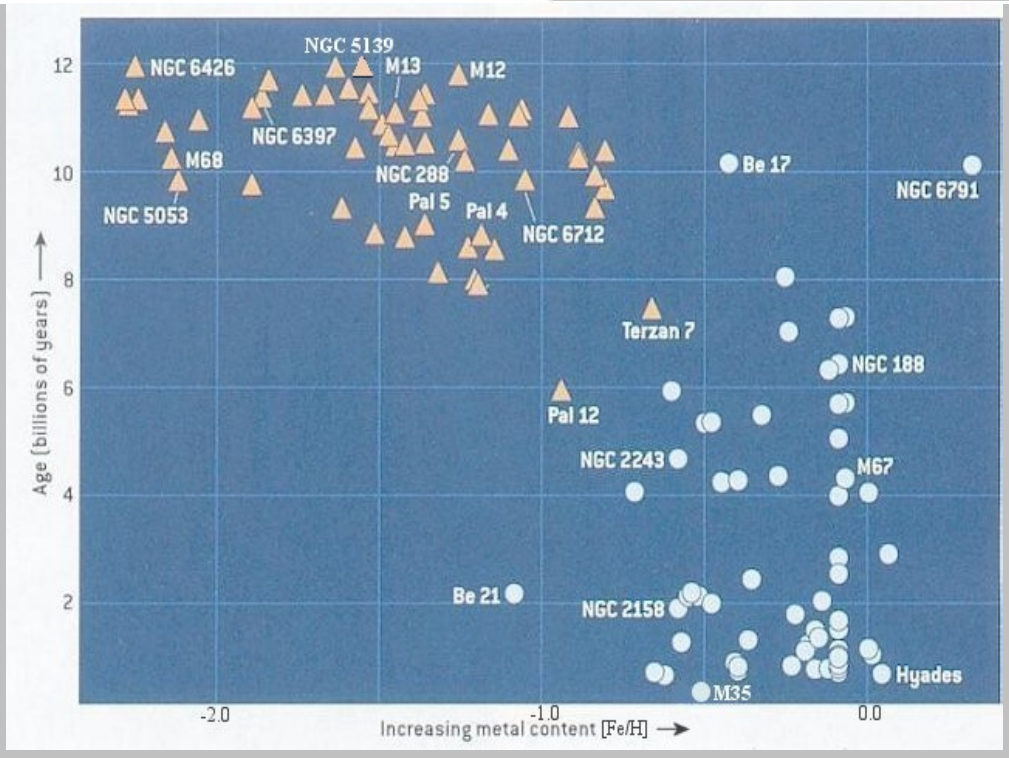
Aglomerados Globulares:

- Dezenas de milhares a 1 milhão de estrelas.
- Idades: alguns bilhões a mais de 10 bilhões de anos.
- Exemplos: Omega Centauri e 47Tucanae

Distribuição de aglomerados na Via láctea




N
[Fe/H]≤-0.8
E
+5°
0°
-5°
S
N
[Fe/H]>-0.8
E
+47 Tuc
S


NGC 5139
NGC 6426
M13
M12
NGC 6397
M68
NGC 288
Be 17
NGC 6791
NGC 5053
Pal 5
Pal 4
NGC 6712
Terzan 7
NGC 188
Pal 12
NGC 2243
M67
Be 21
NGC 2158
Hyades
M35
Age (billions of years)
12
10
8
6
4
2
-2.0
-1.0
0.0
Increasing metal content [Fe/H]

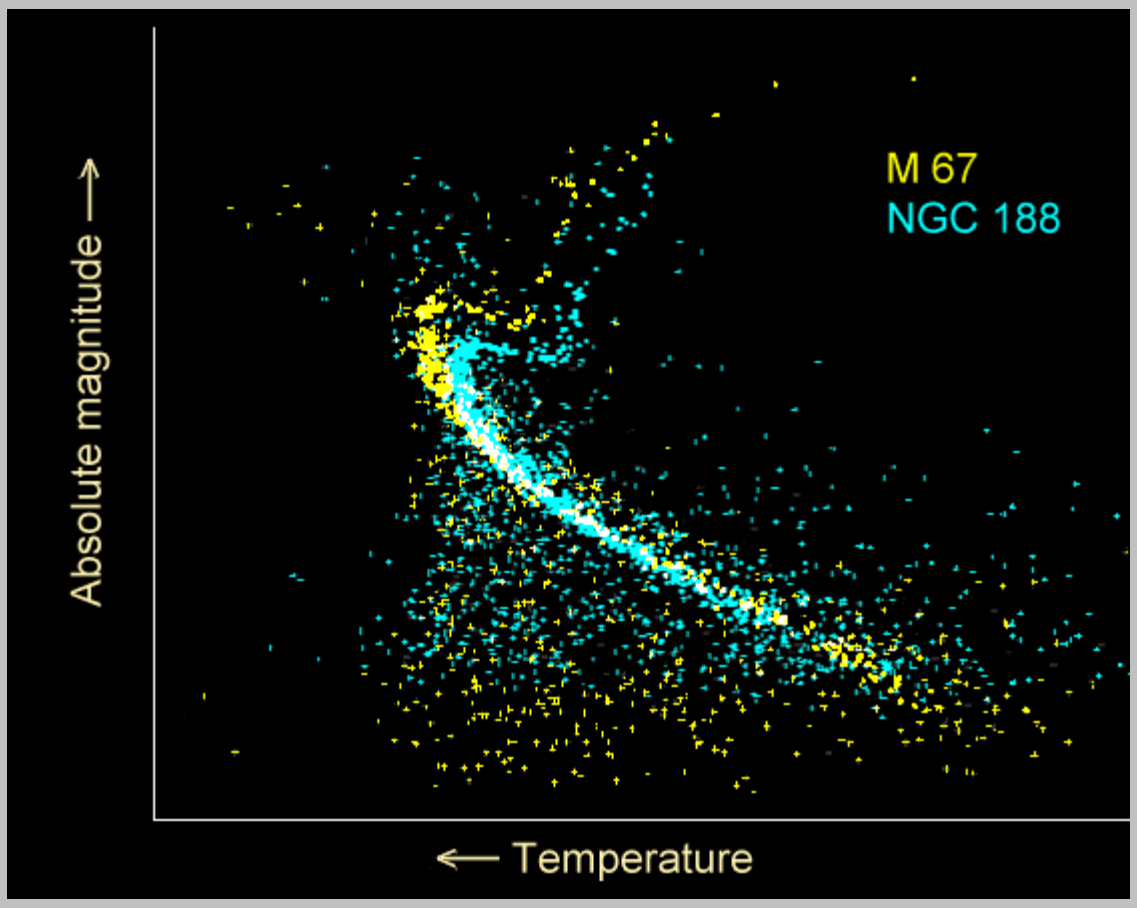
Pleiades

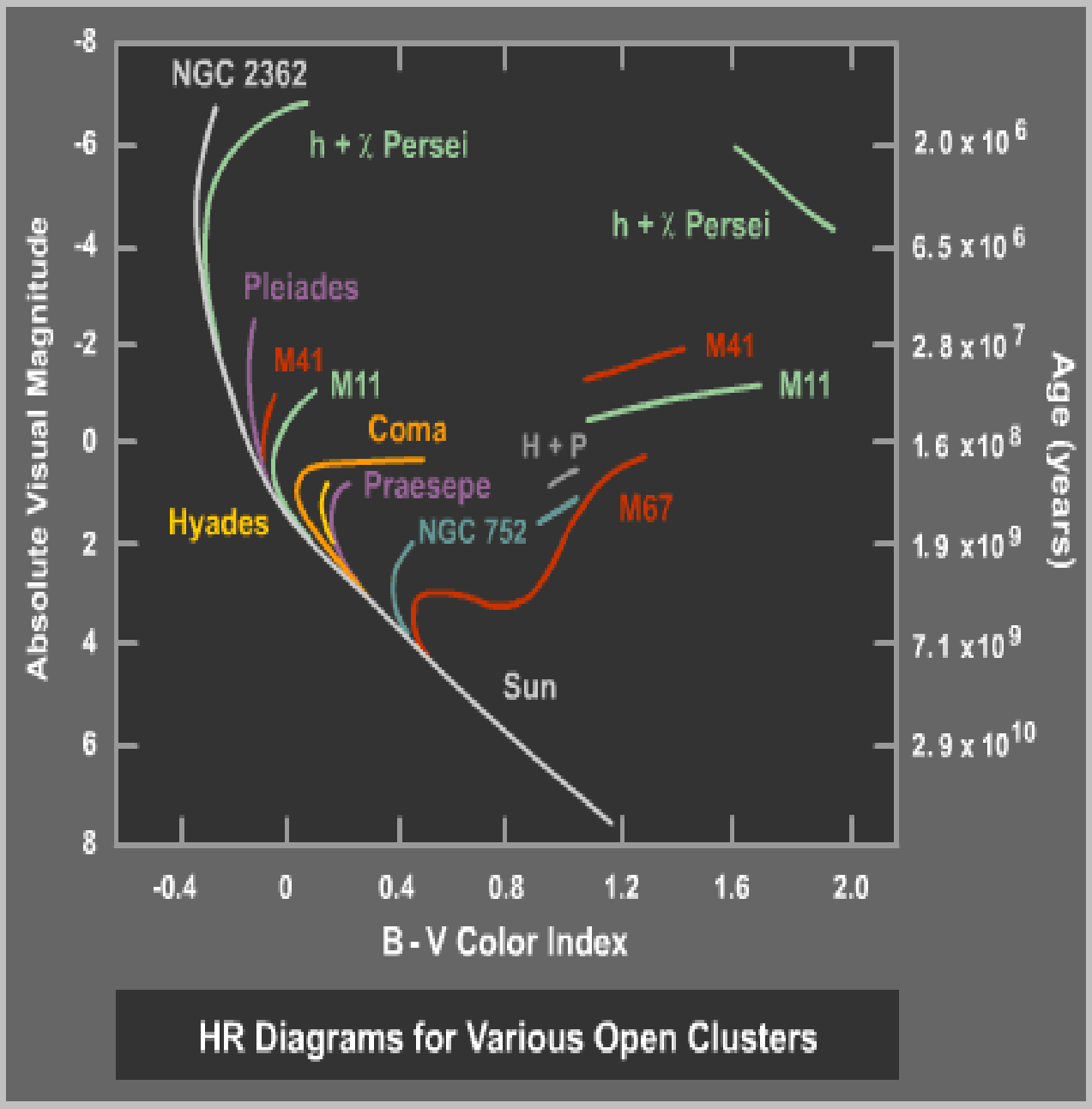
Jewel Box

Open Clusters

h + χ Persei
(young double cluster)

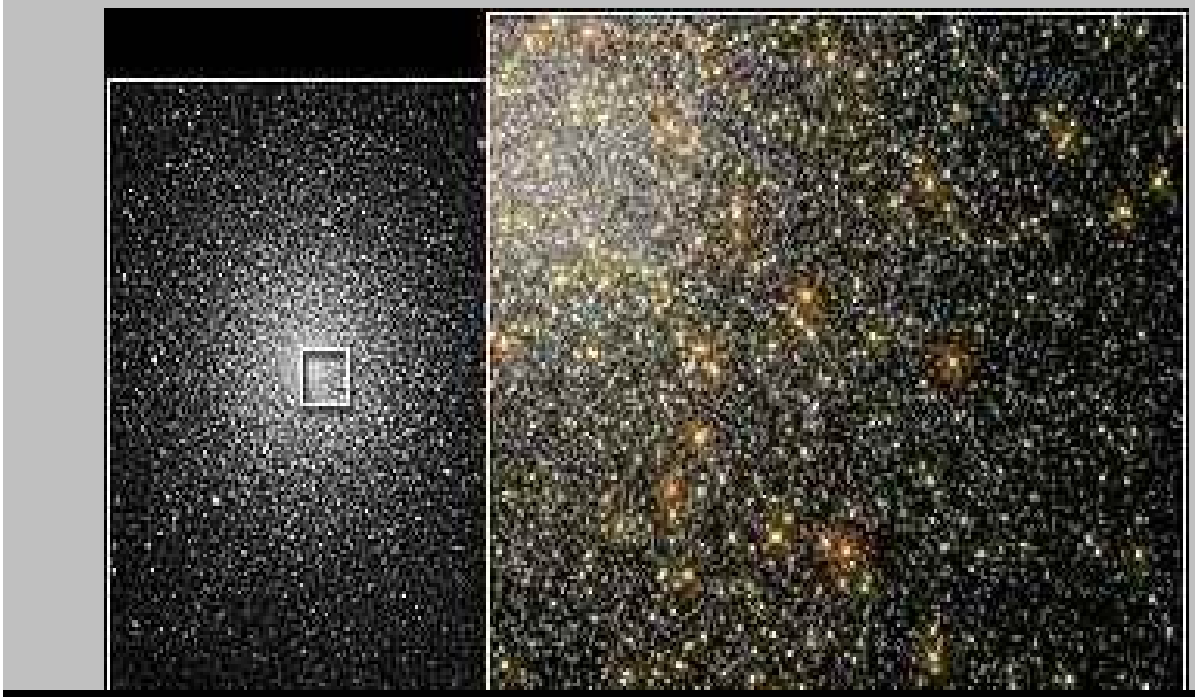
M67
(4 billion year old cluster)





HR Diagrams for Various Open Clusters

47Tucanae (HST) – região central



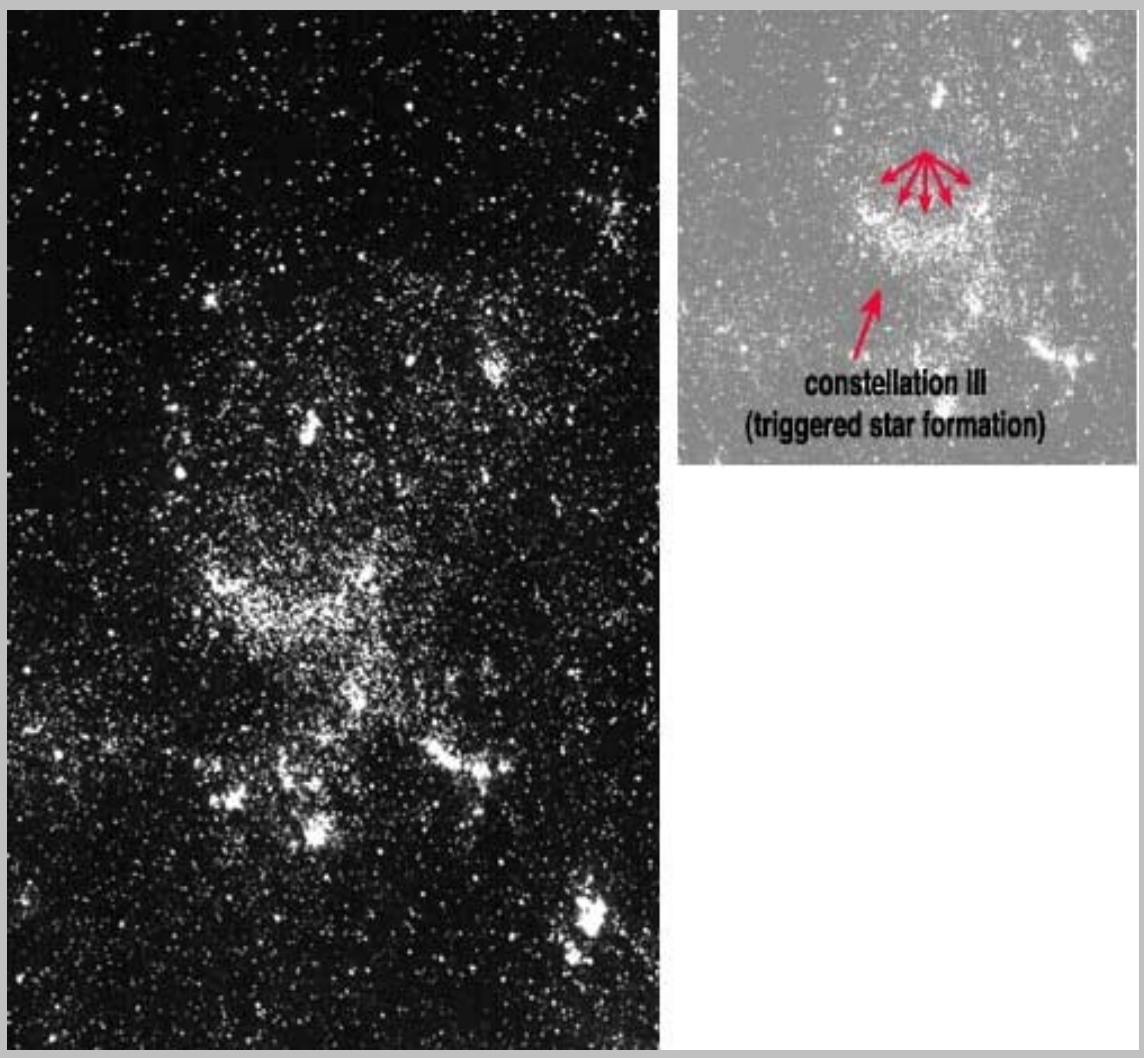
Globular Cluster 47 Tucanae

NASA, ESA, and G. Meylan (Ecole Polytechnique Federale de Lausanne) ▪ STScI-PRC06-33

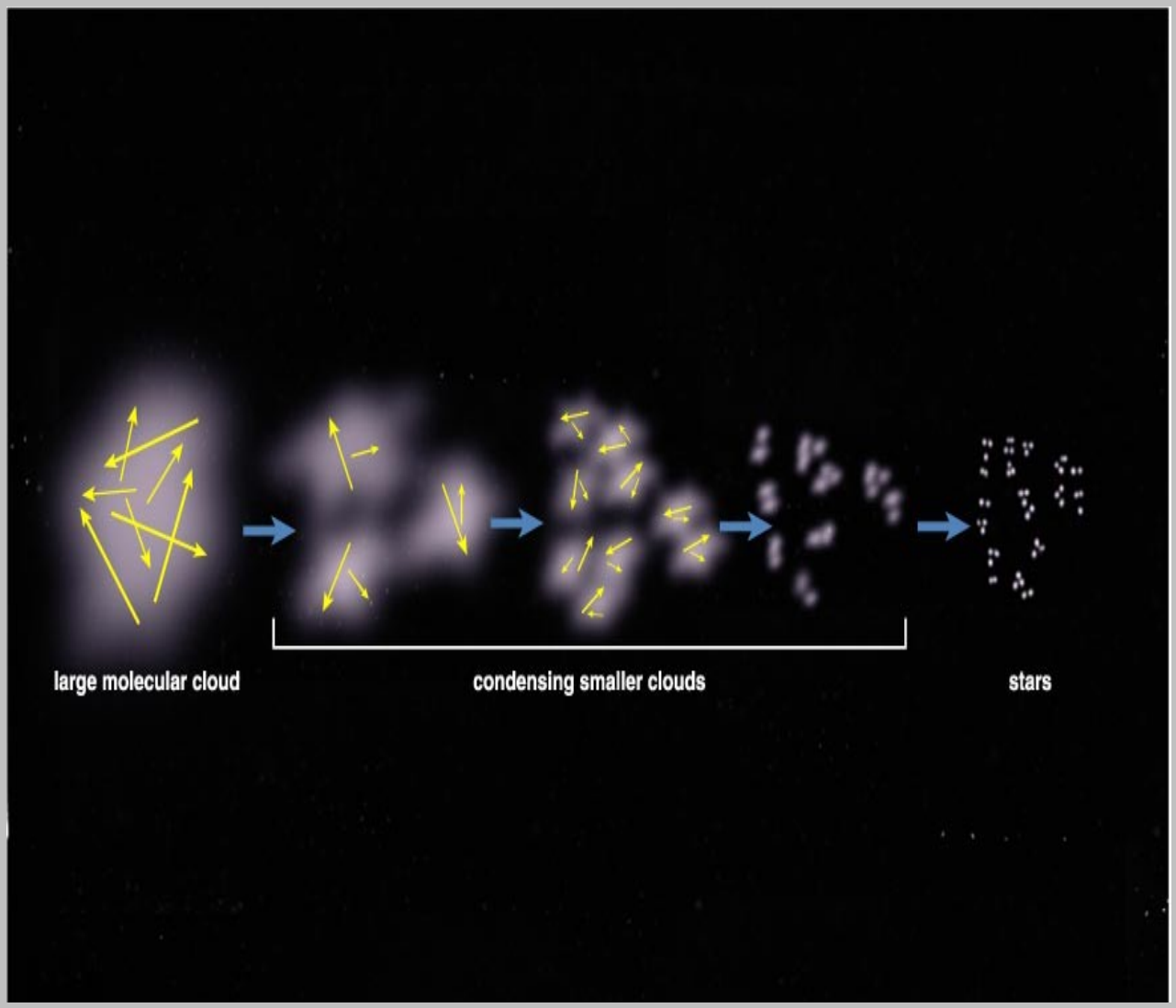
Very Large Telescope (Ground-based)

Hubble Space Telescope ACS

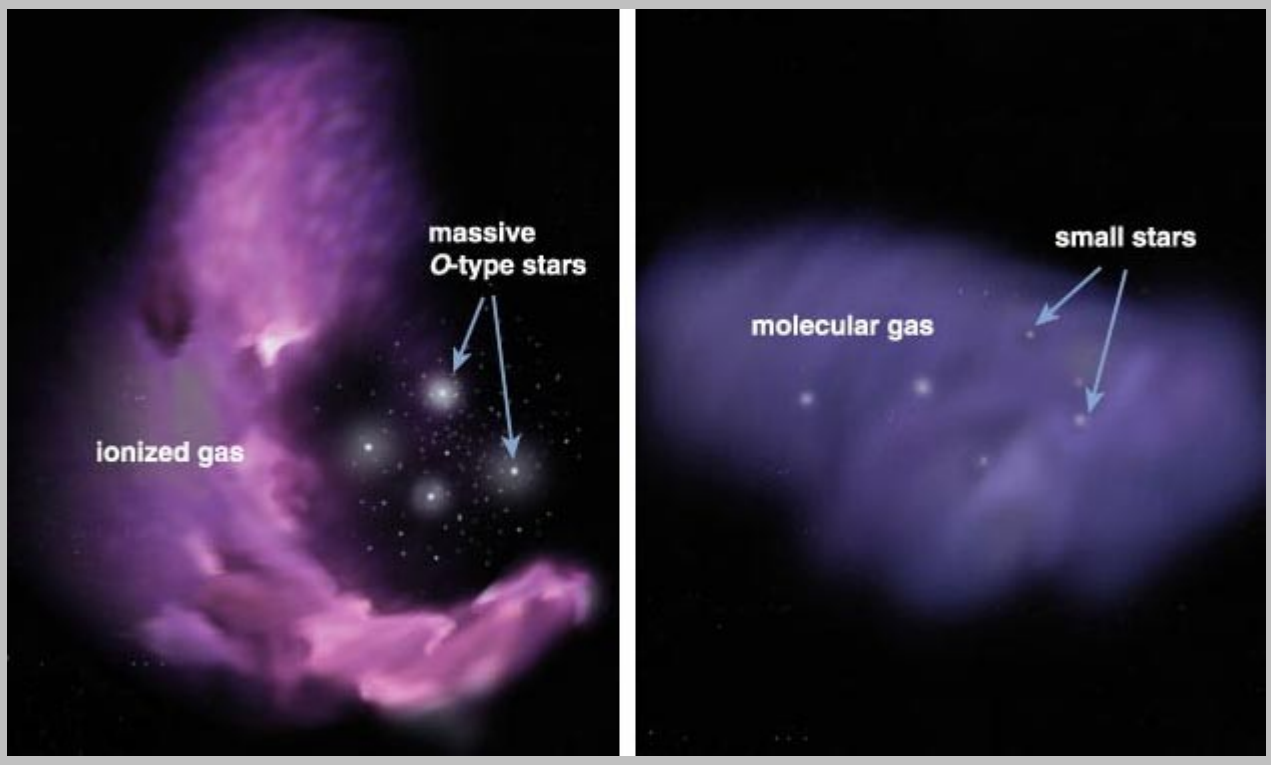
Formação de aglomerados por contração gravitacional de nuvens moleculares.



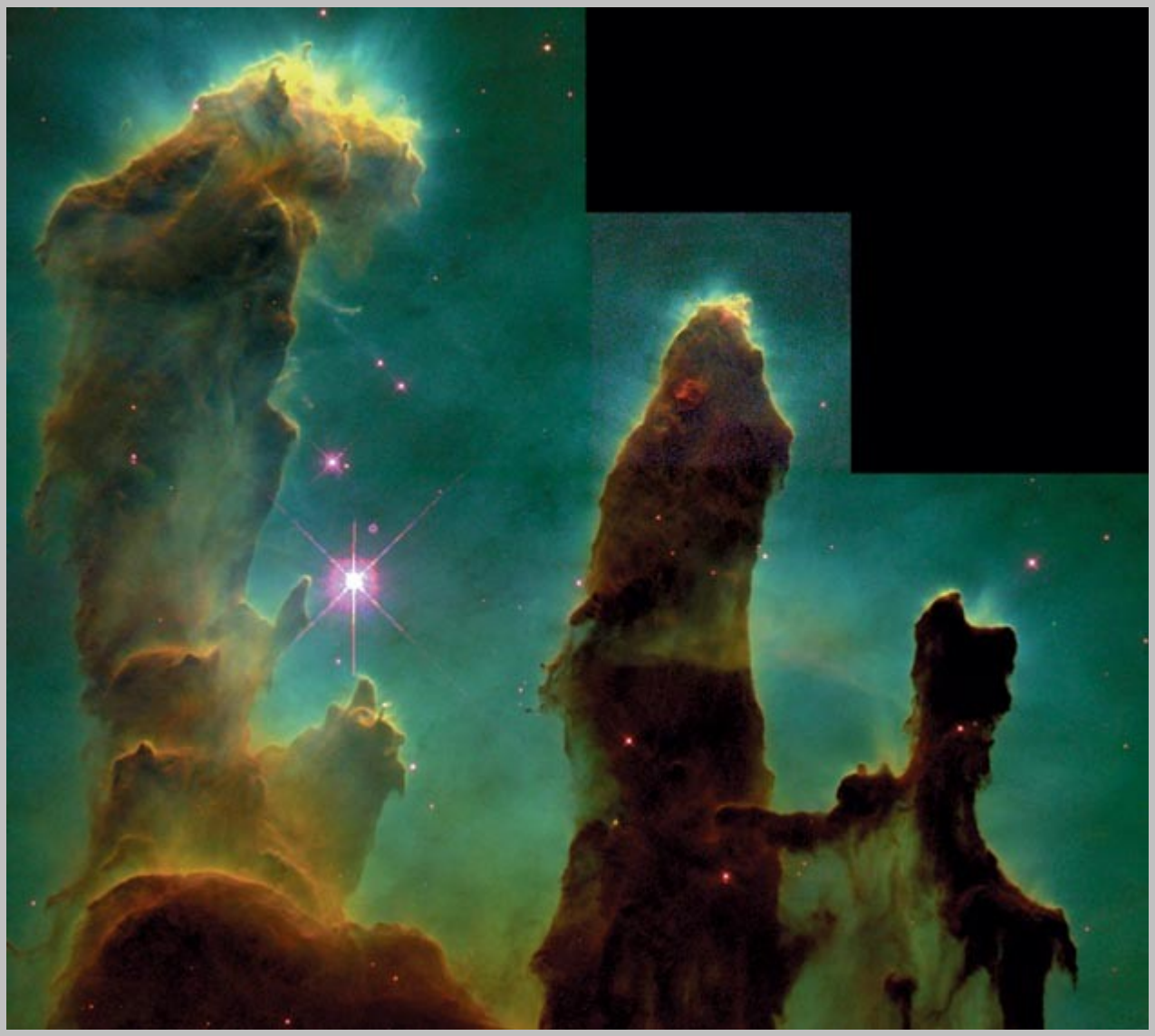
Cenário de formação estelar por contração gravitacional



Estágios avançados da contração gravitacional



Estágios finais (I)

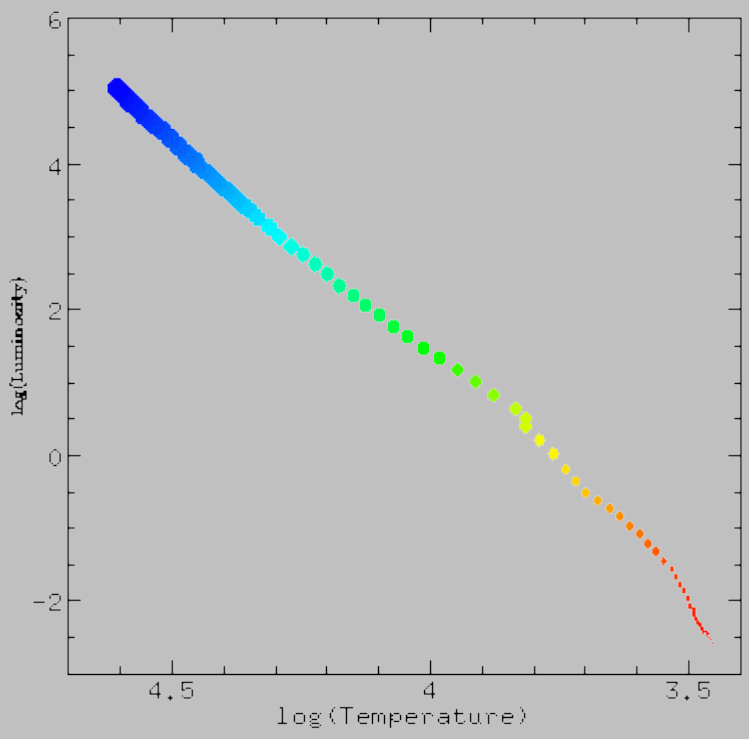


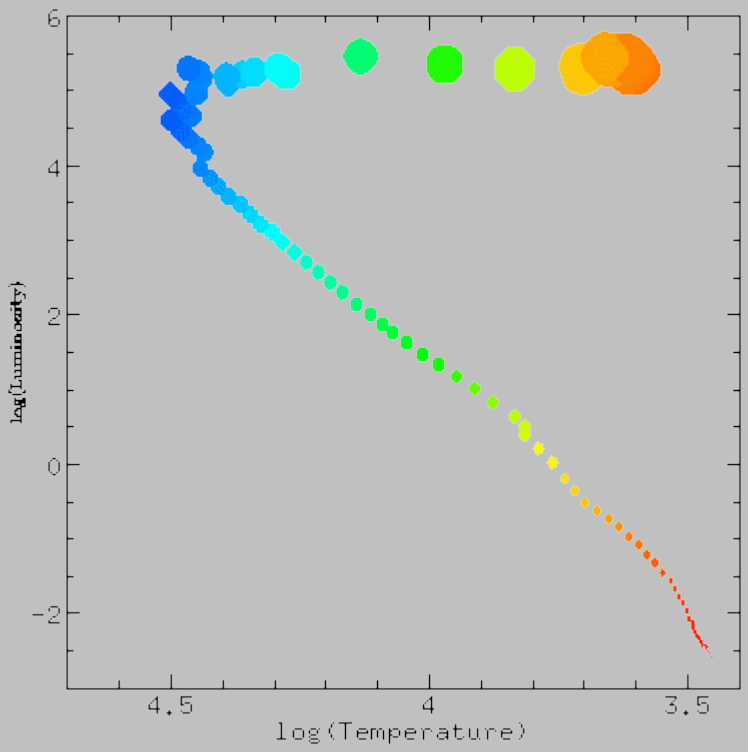
Estágios finais da formação estelar (II)

Região de formação de estrelas NGC3603 + aglomerado estelar jovem e massivo

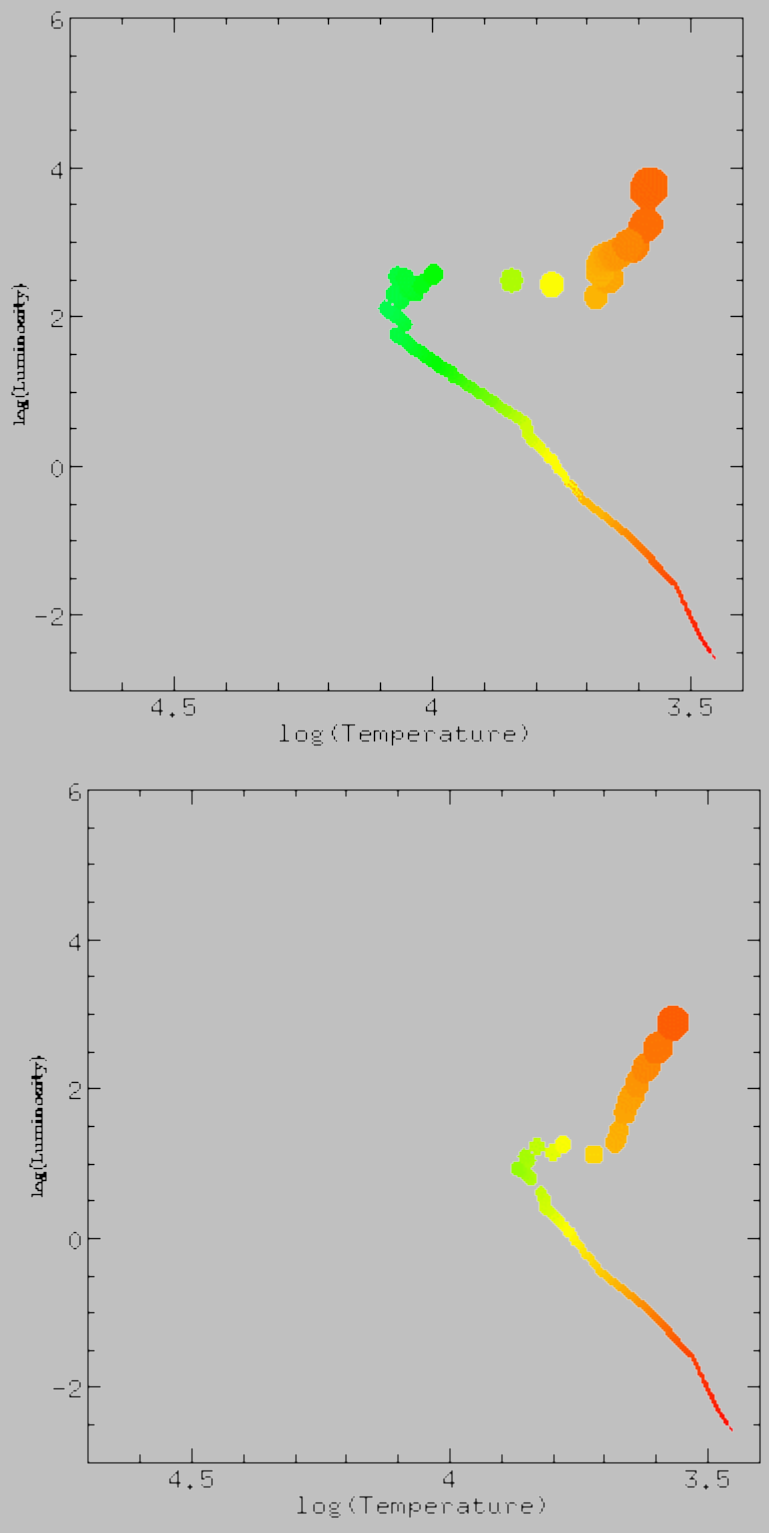
Nebulosa de Orion

Idade: 0 e 8 milhões de anos

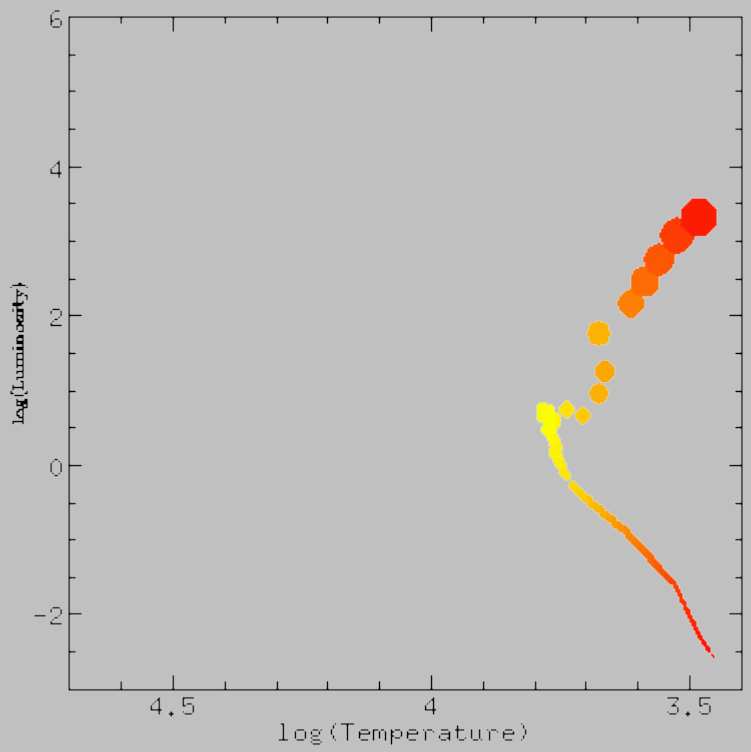




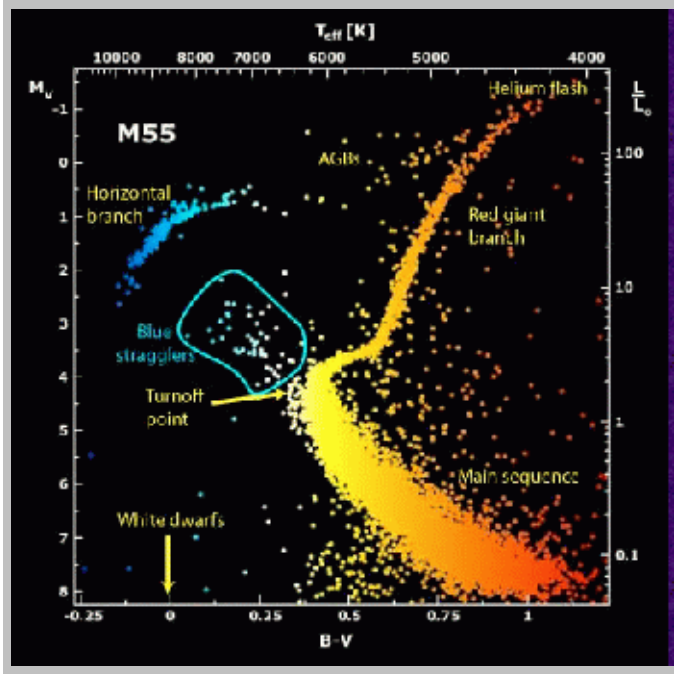
Idade: 256 milhões e 3 bilhões de anos

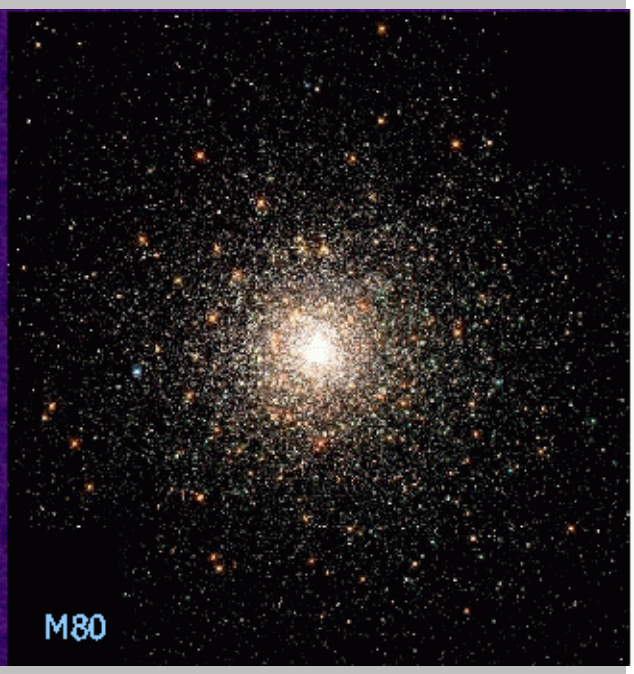


Idade: 8 bilhões de anos

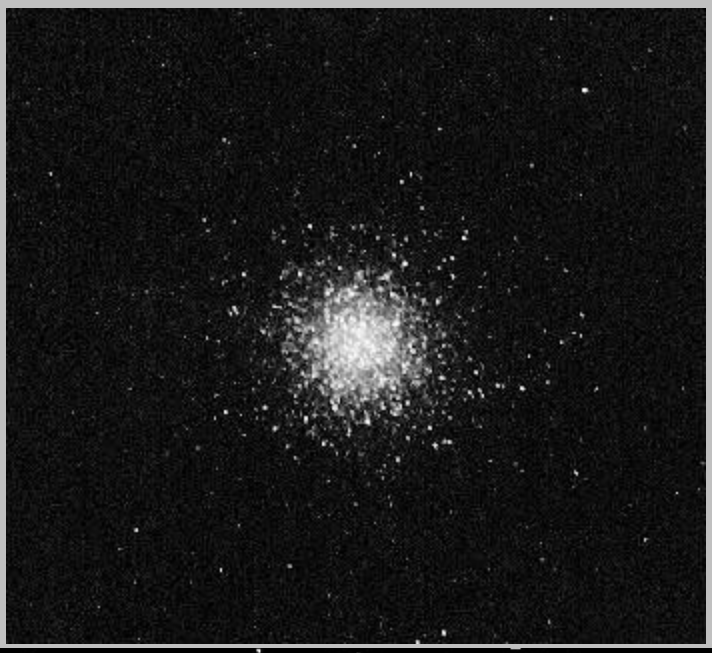


População velha em aglomerados globulares

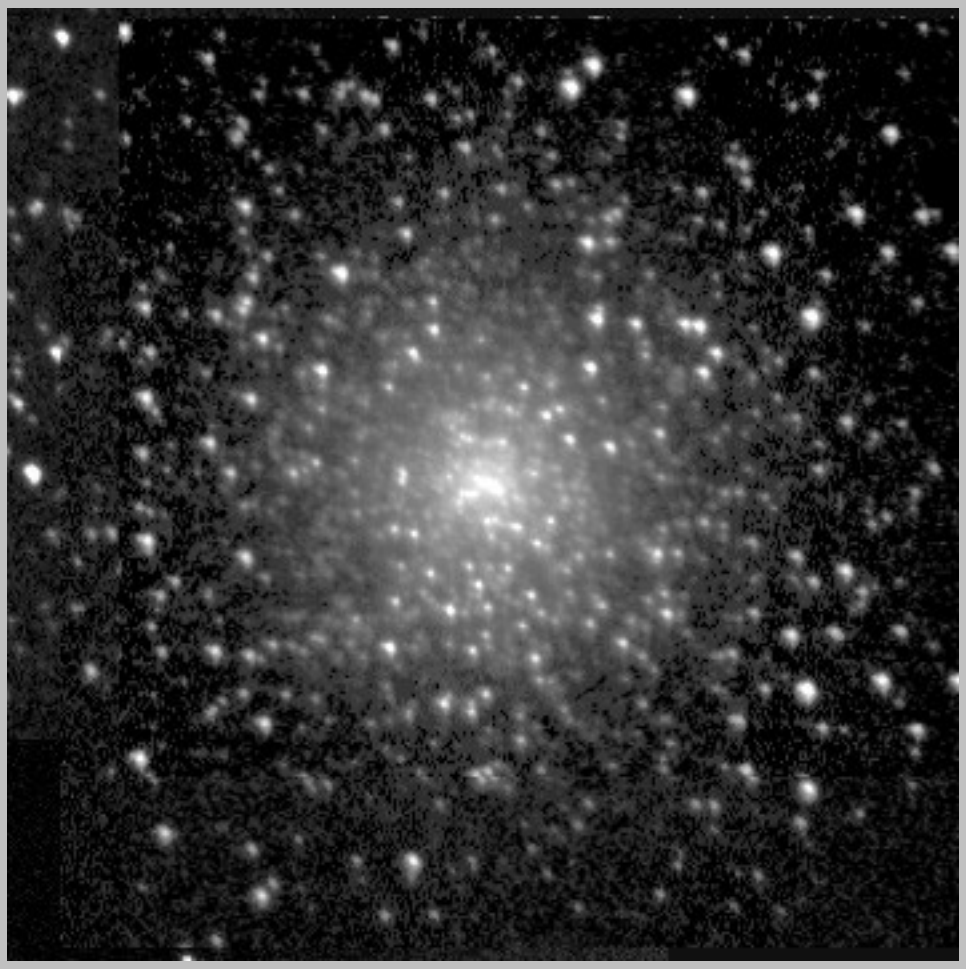


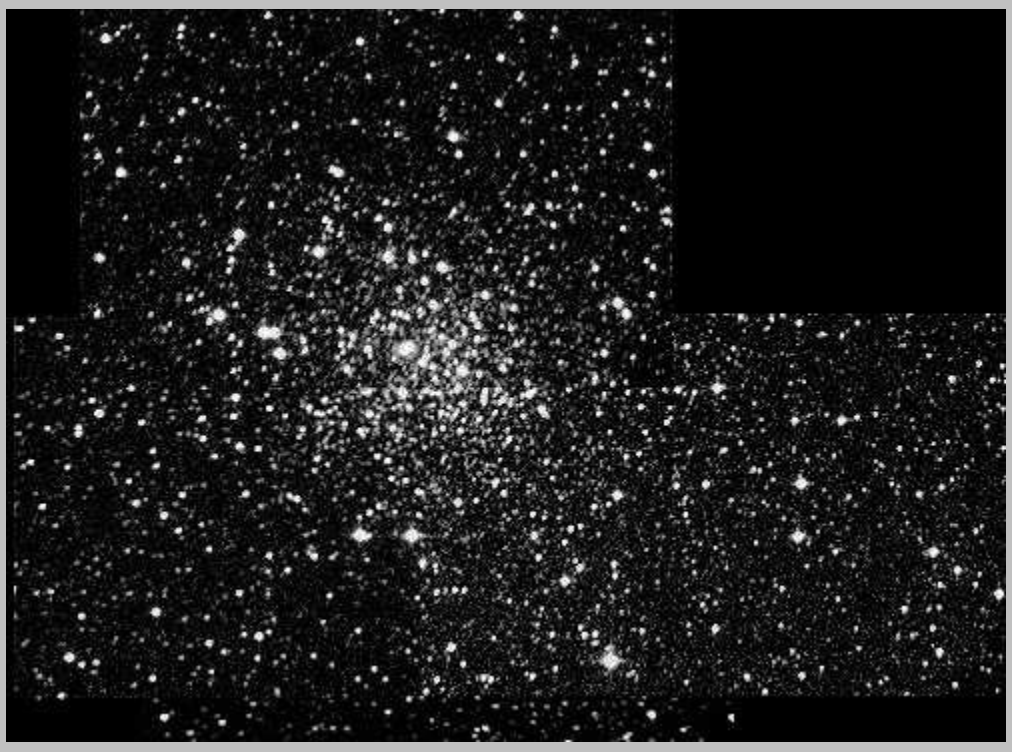


M13 e M14



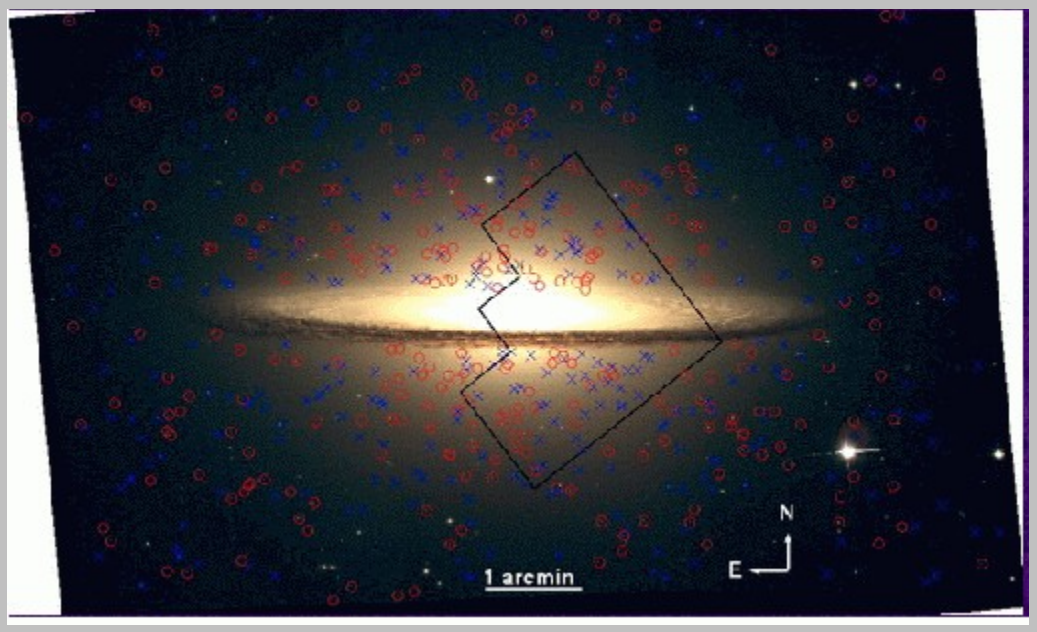
M15 e M71





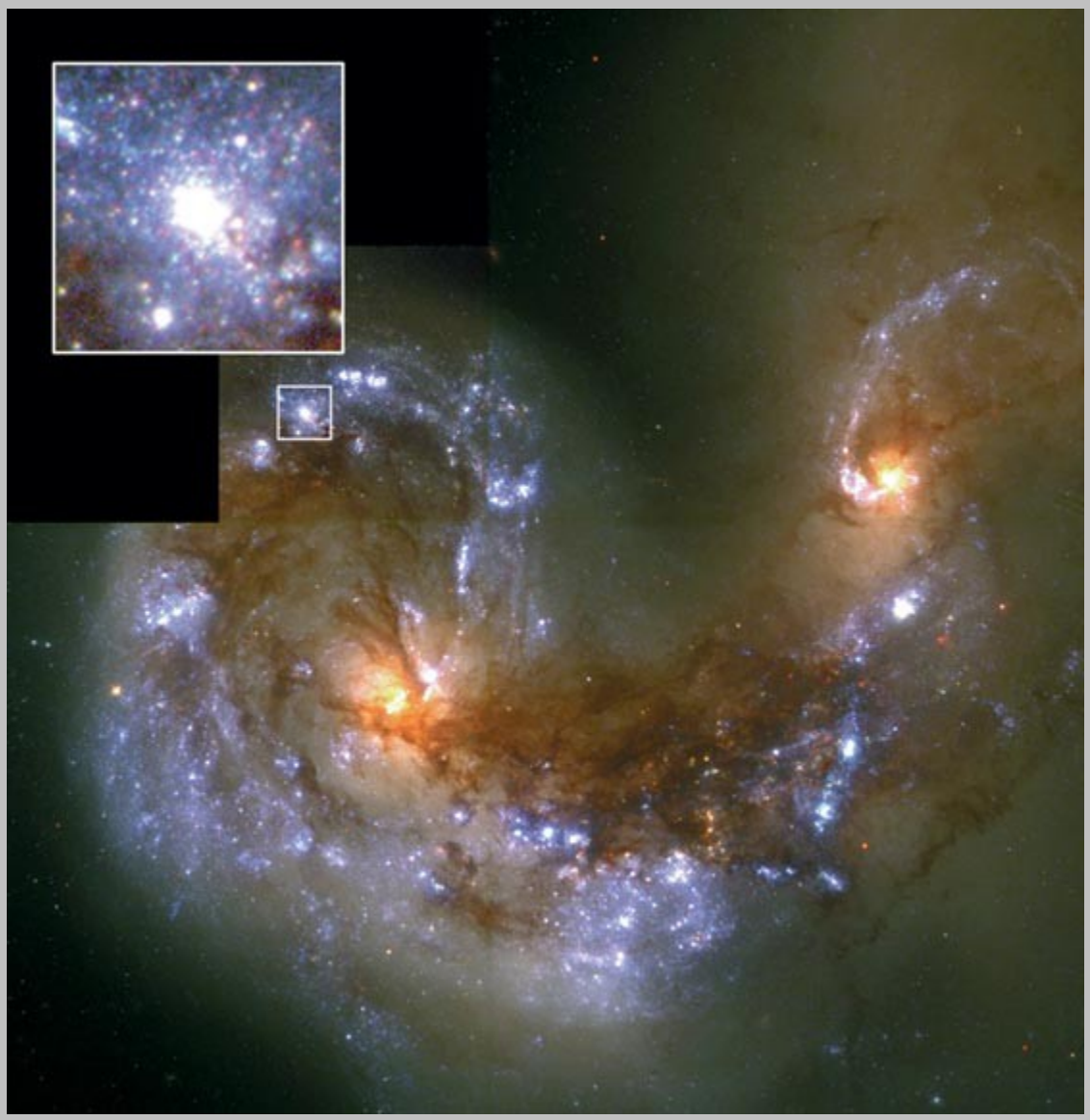
Aglomerados globulares em outras galáxias

M104 – Sombrero Galaxy

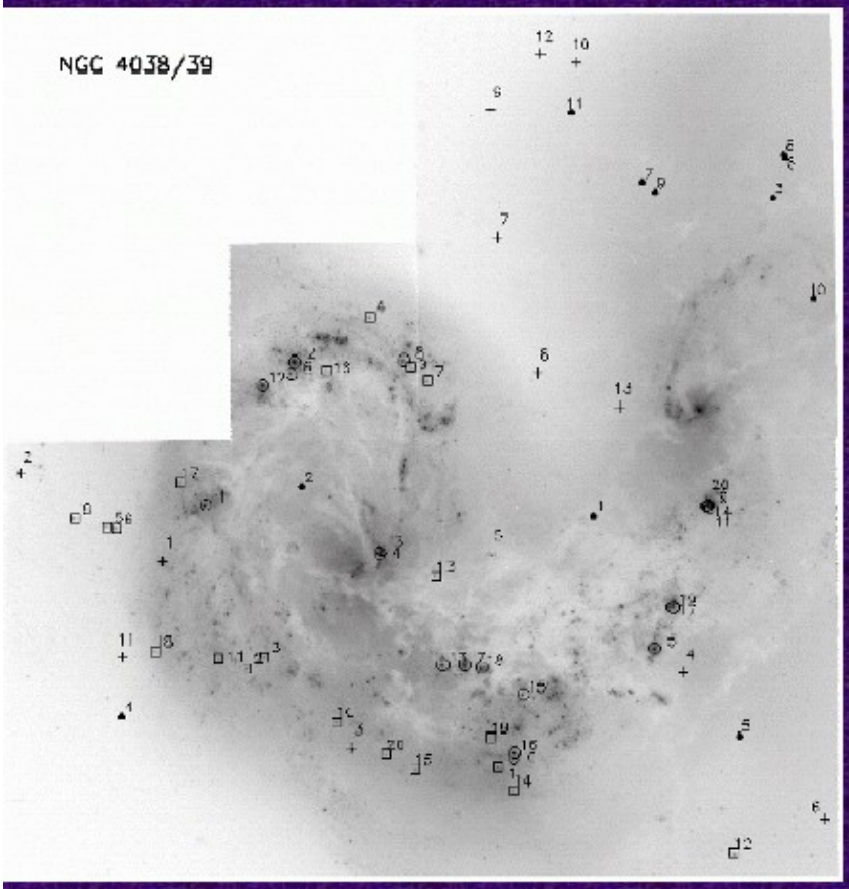


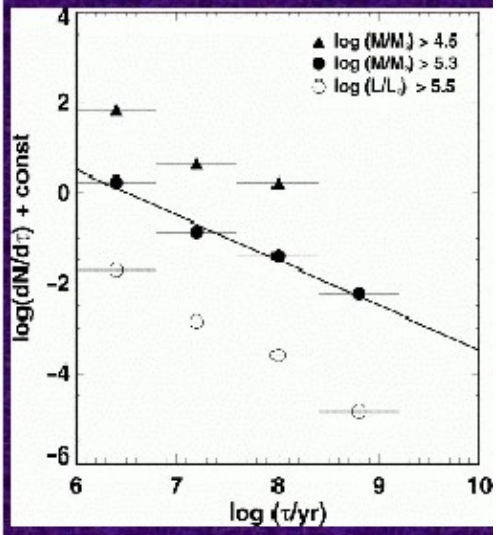
Azuis – Gcs pobres em metais
Vermelhos – Gcs ricos em metais

Aglomerados Globulares em Antennae (NGC4038/4039)

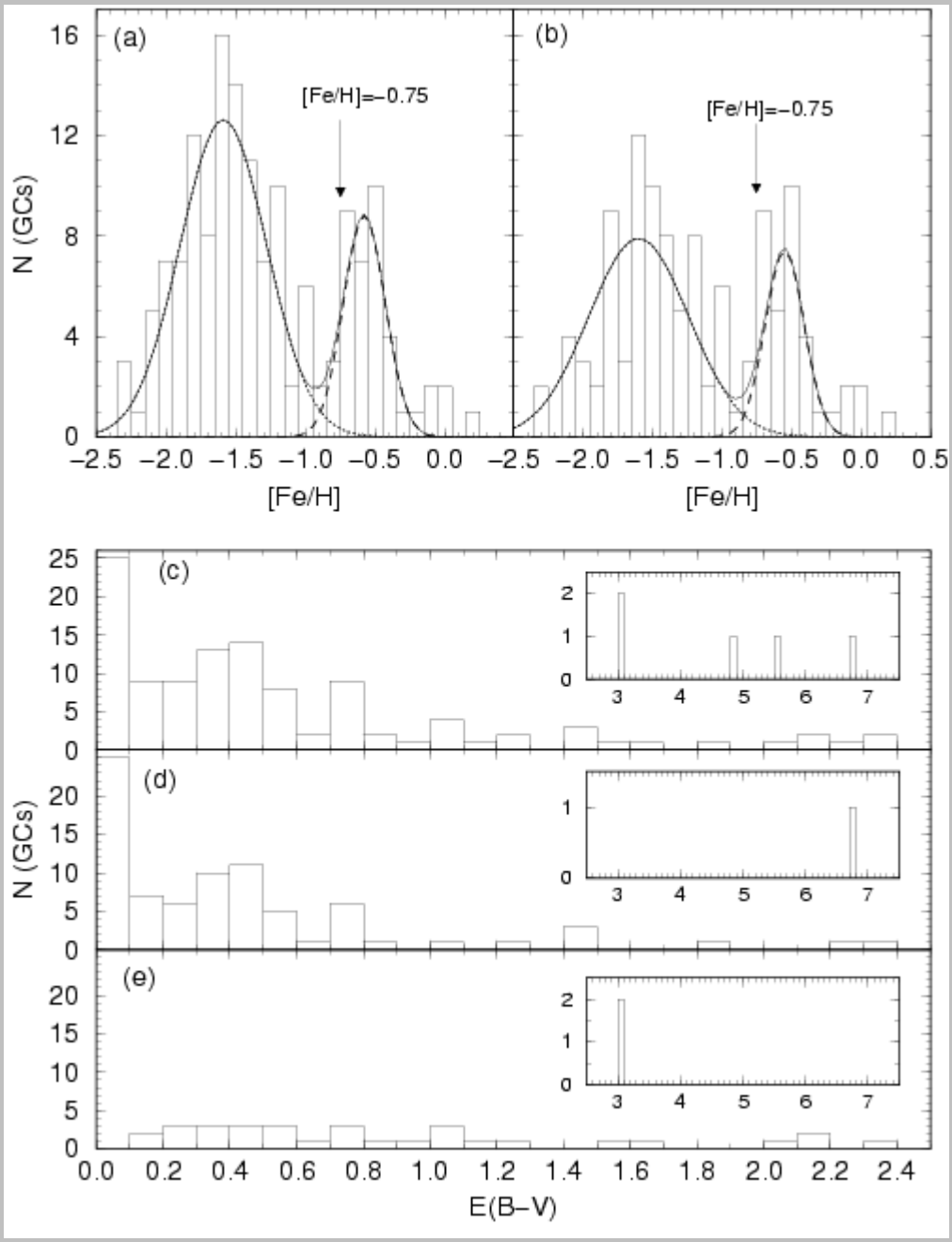


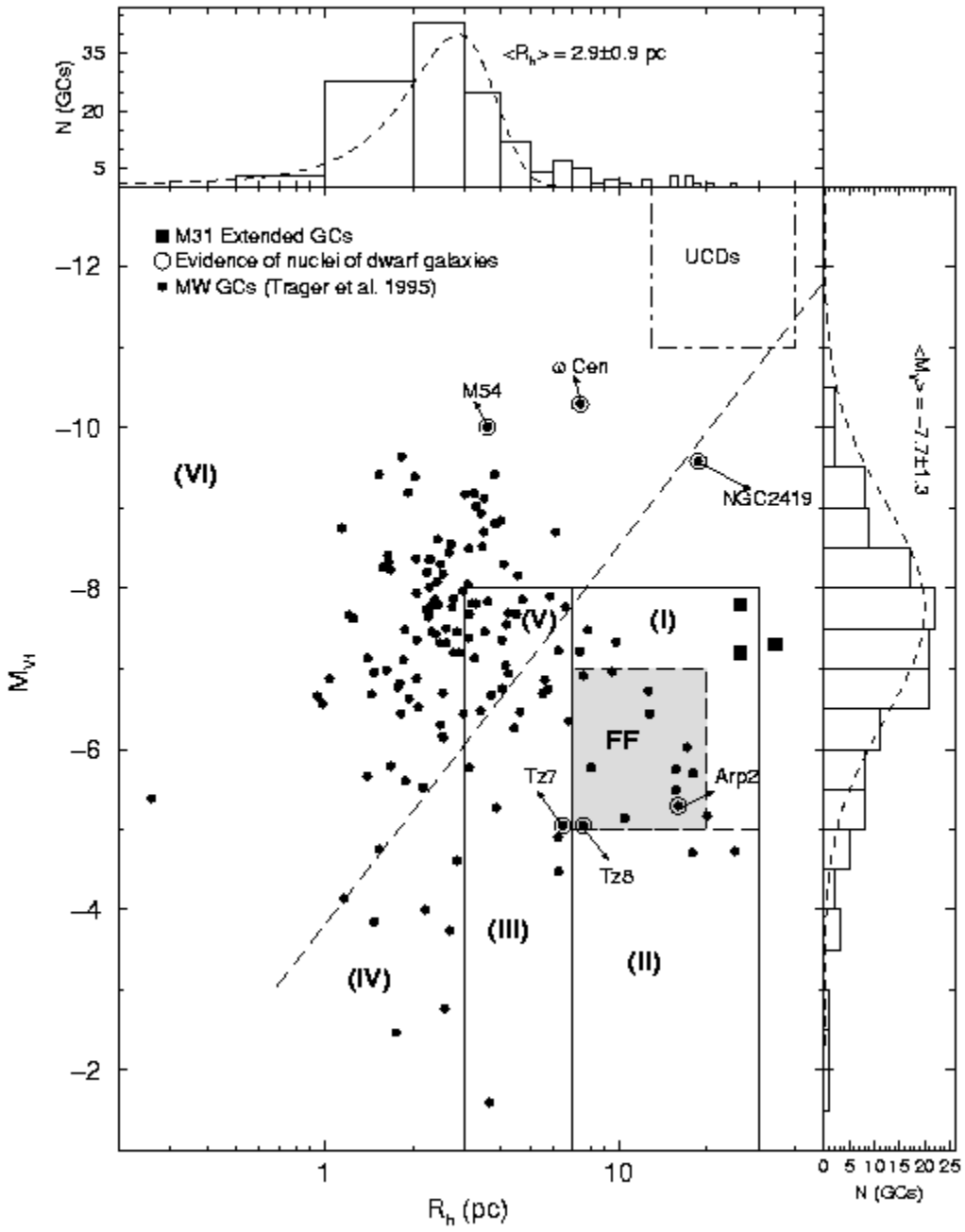
Antennae Clusters



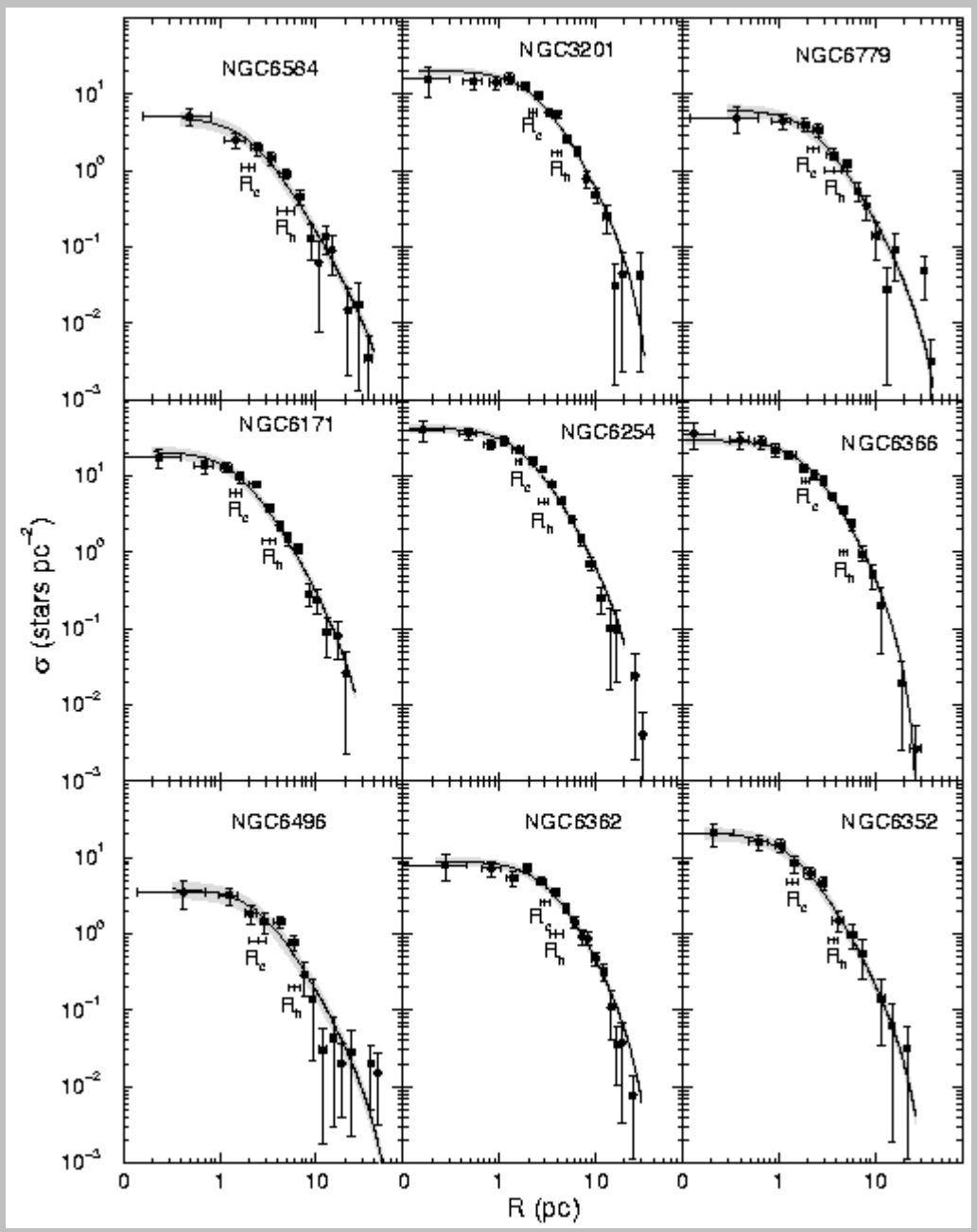


Estatística dos aglomerados globulares da Galáxia

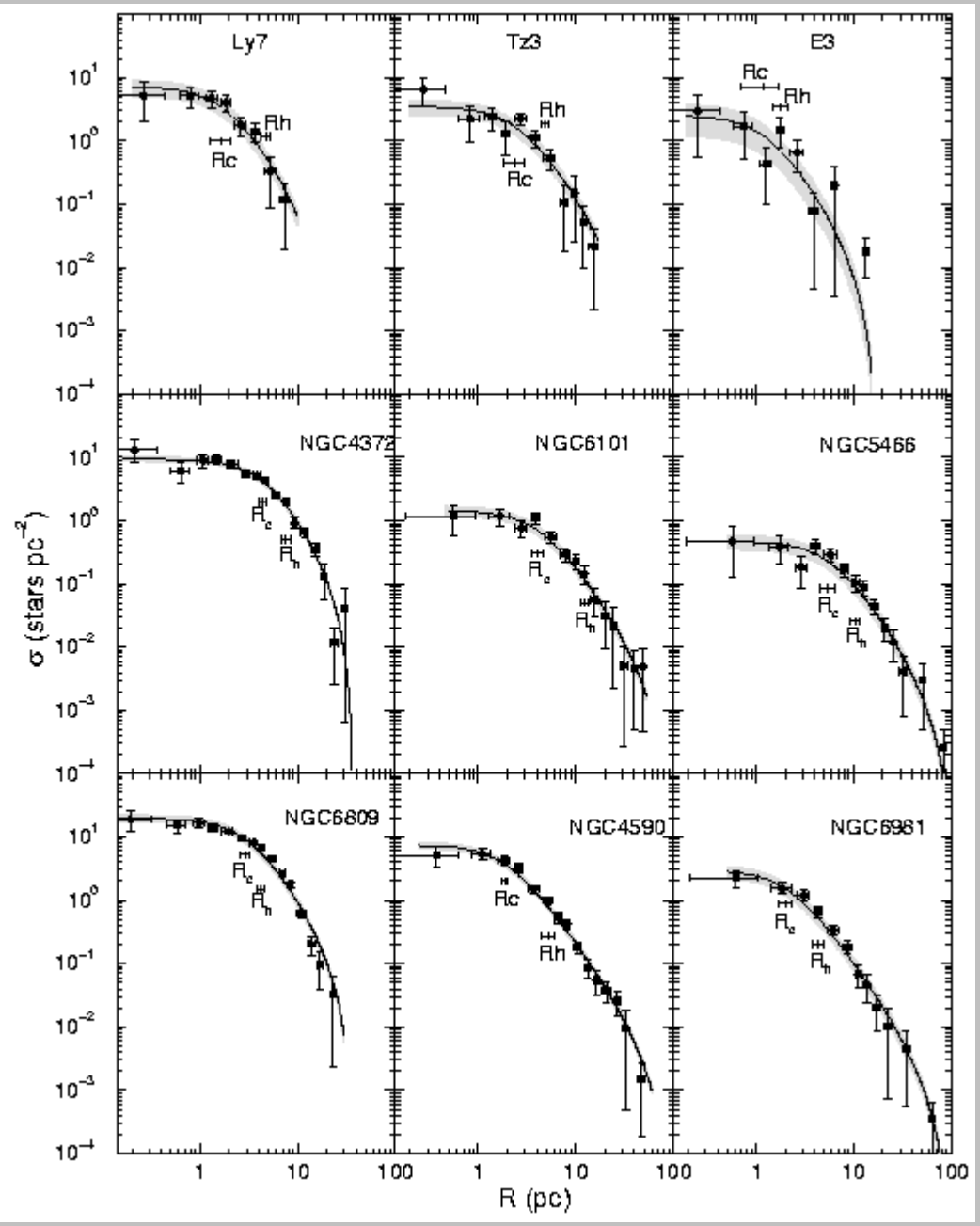



N (GCs)
35
20
5
<R_h> = 2.9±0.9 pc
M31 Extended GCs
Evidence of nuclei of dwarf galaxies
MW GCs (Trager et al. 1995)
UCDs
ω Cen
M54
NGC2419
(VI)
(V)
(I)
FF
Tz7
Arp2
Tz8
(III)
(II)
(IV)
<M_V> = −7.7±1.3
−12
−10
−8
−6
−4
−2
M_V1
1
10
R_h (pc)
0 5 10 15 20 25
N (GCs)

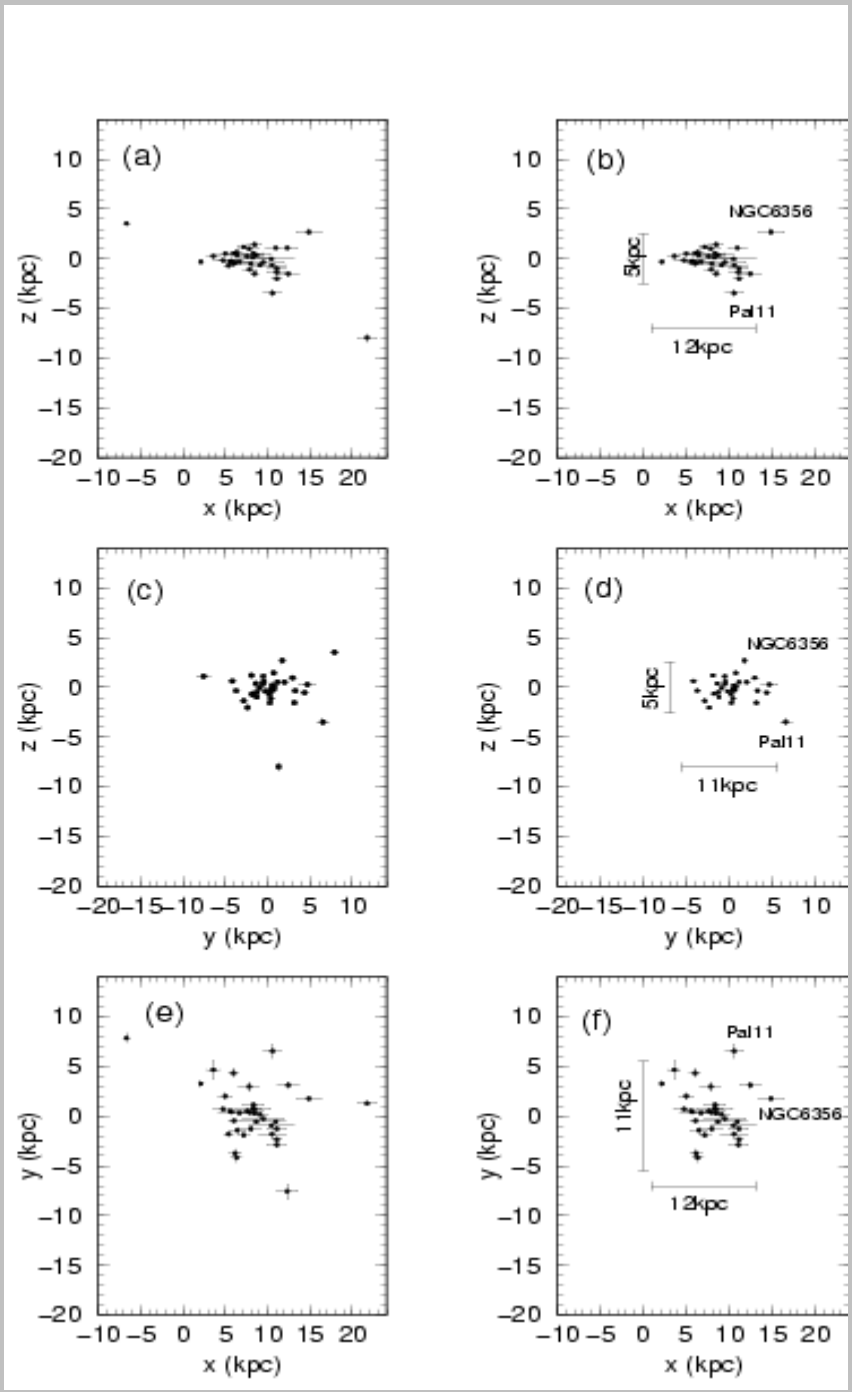
Densidade radial de estrelas: esferas isotérmicas, relaxação dinâmica, equipartição de energia, core-collapse, etc.



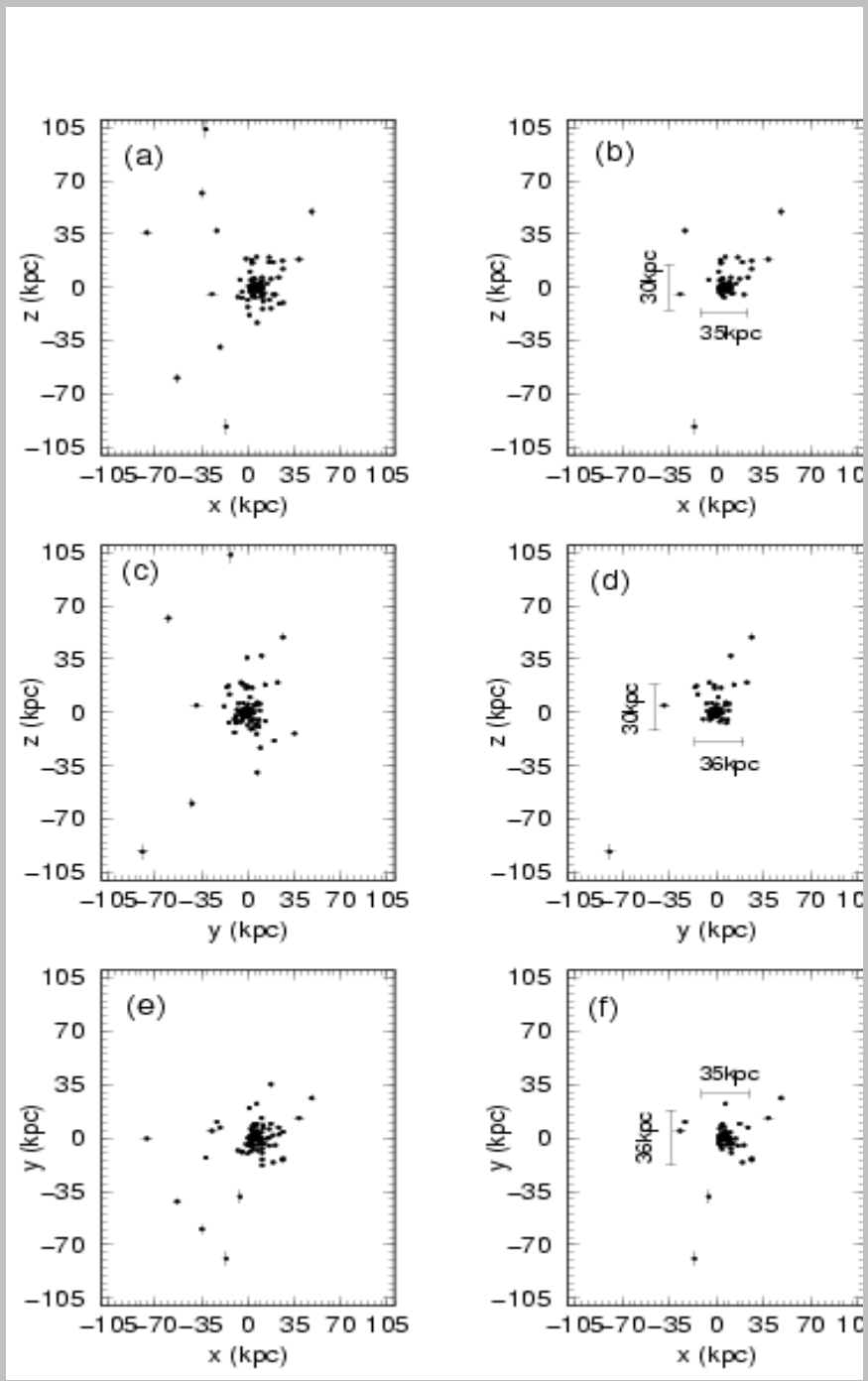
Core-collapse: Tz3 e NGC4372



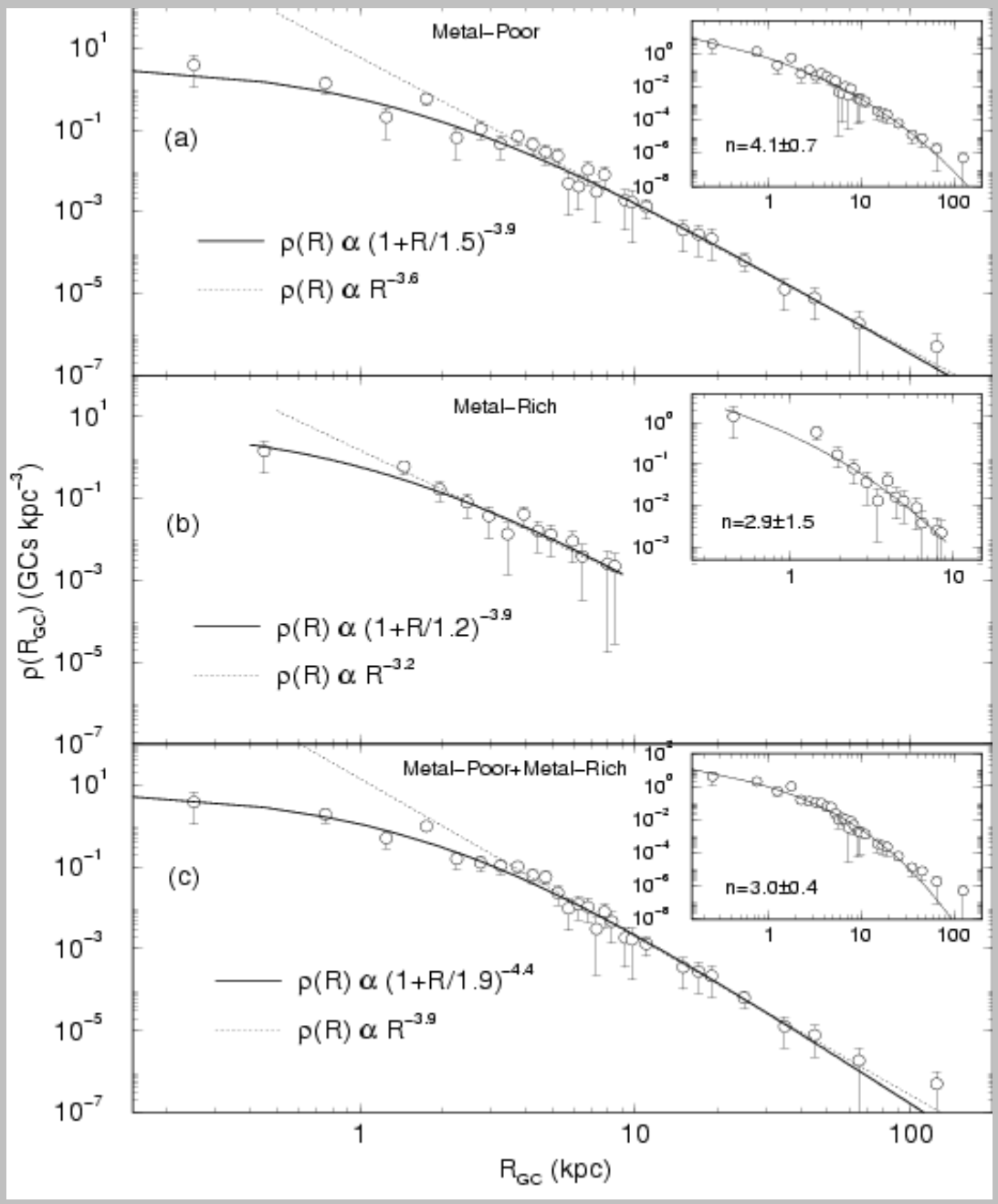
Distribuição espacial dos Aglomerados globulares Galácticos.
(a) – Ricos em metais (bojo)



(b) – Pobres em metais (halo)

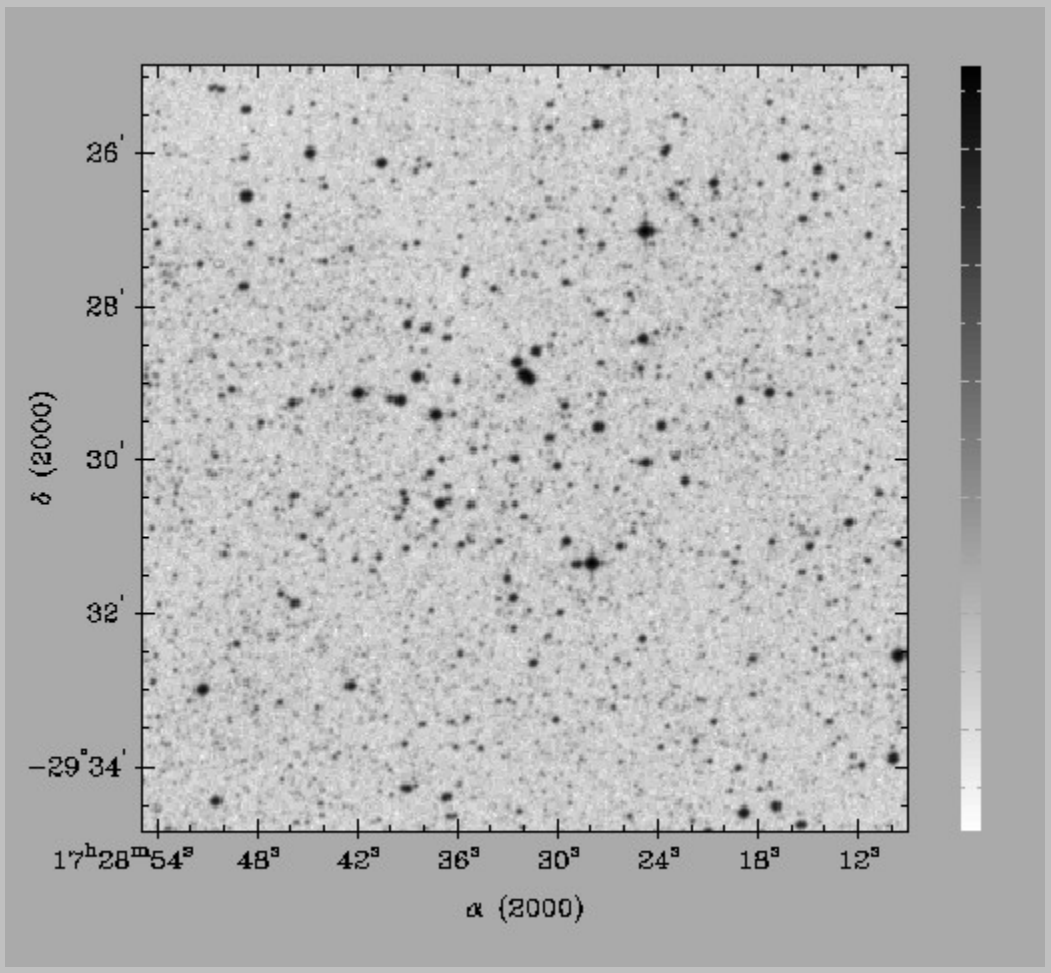


Distribuição radial

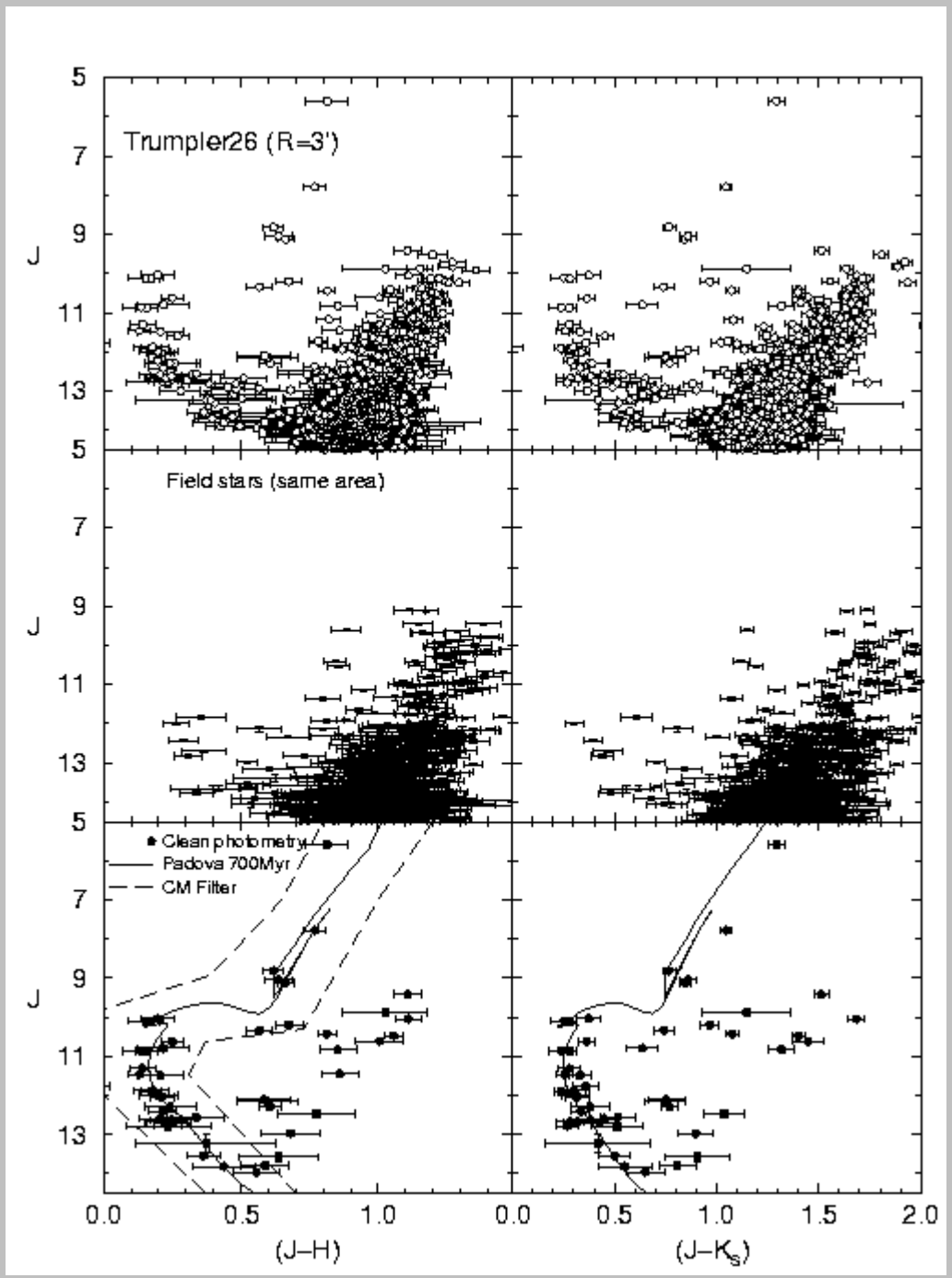


Métodos de análise de aglomerados estelares.

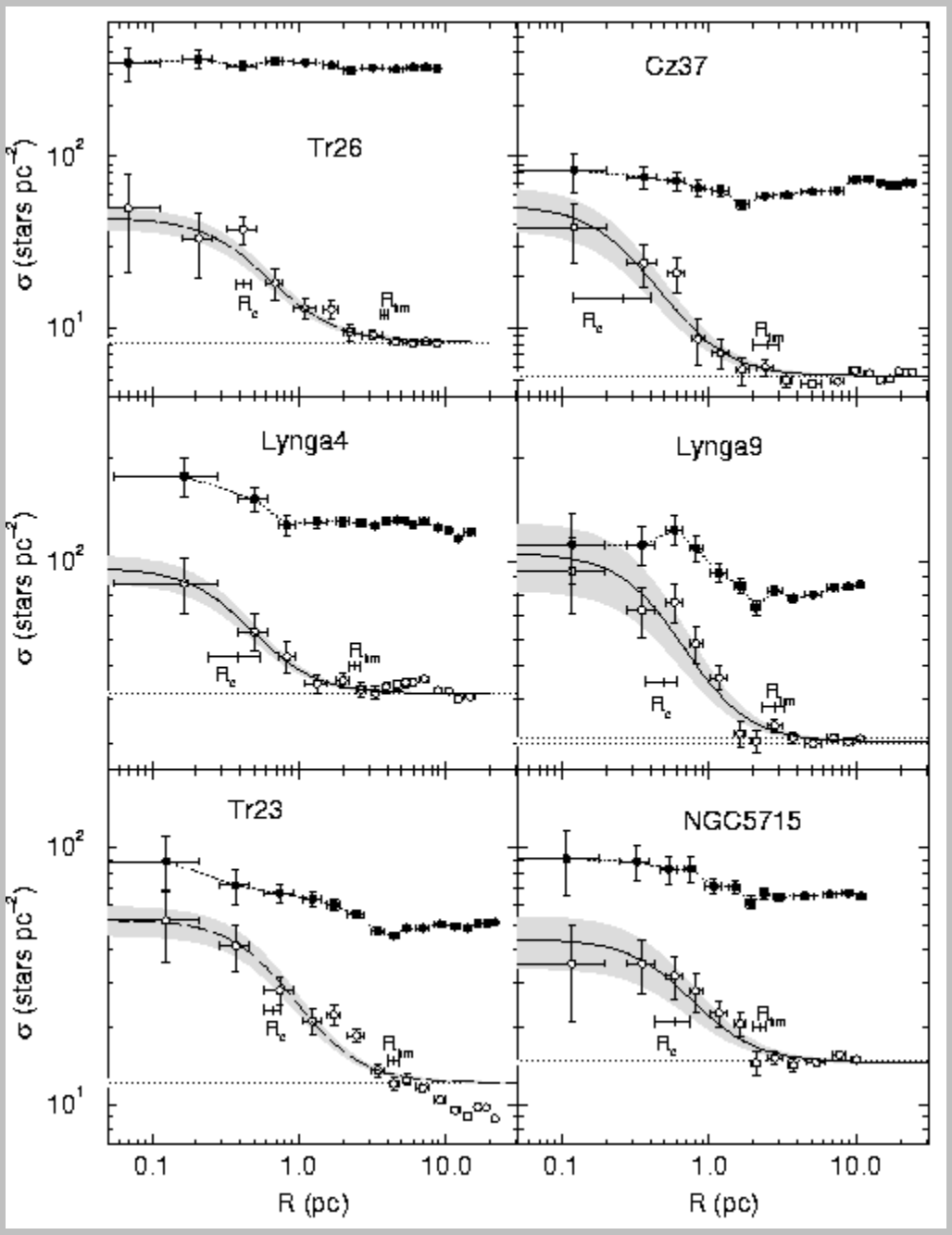
Ex. Aglomerado aberto Trumpler26, projetado contra o centro Galáctico.



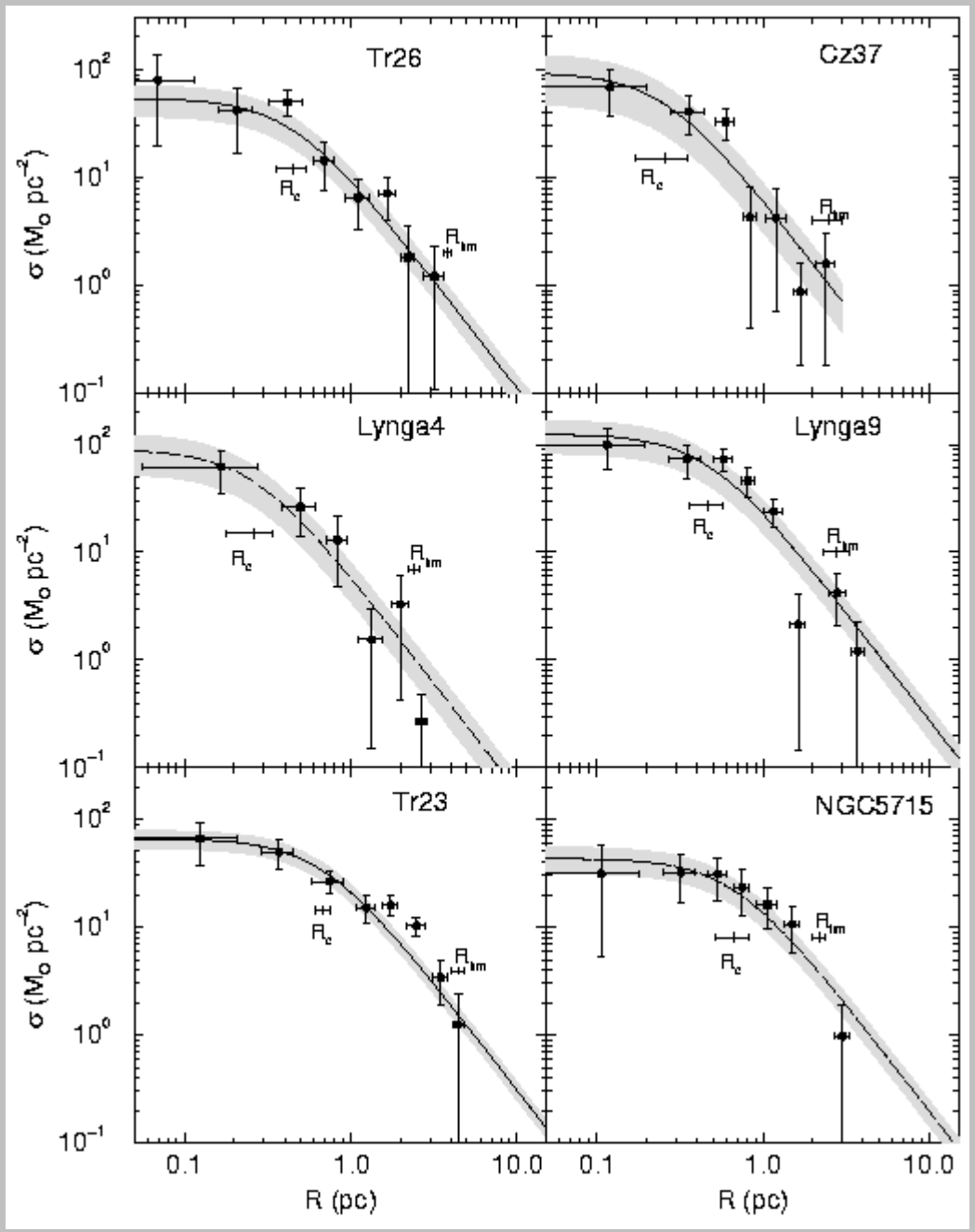
Diagramas HR, descontaminação de campo e ajuste de idade.



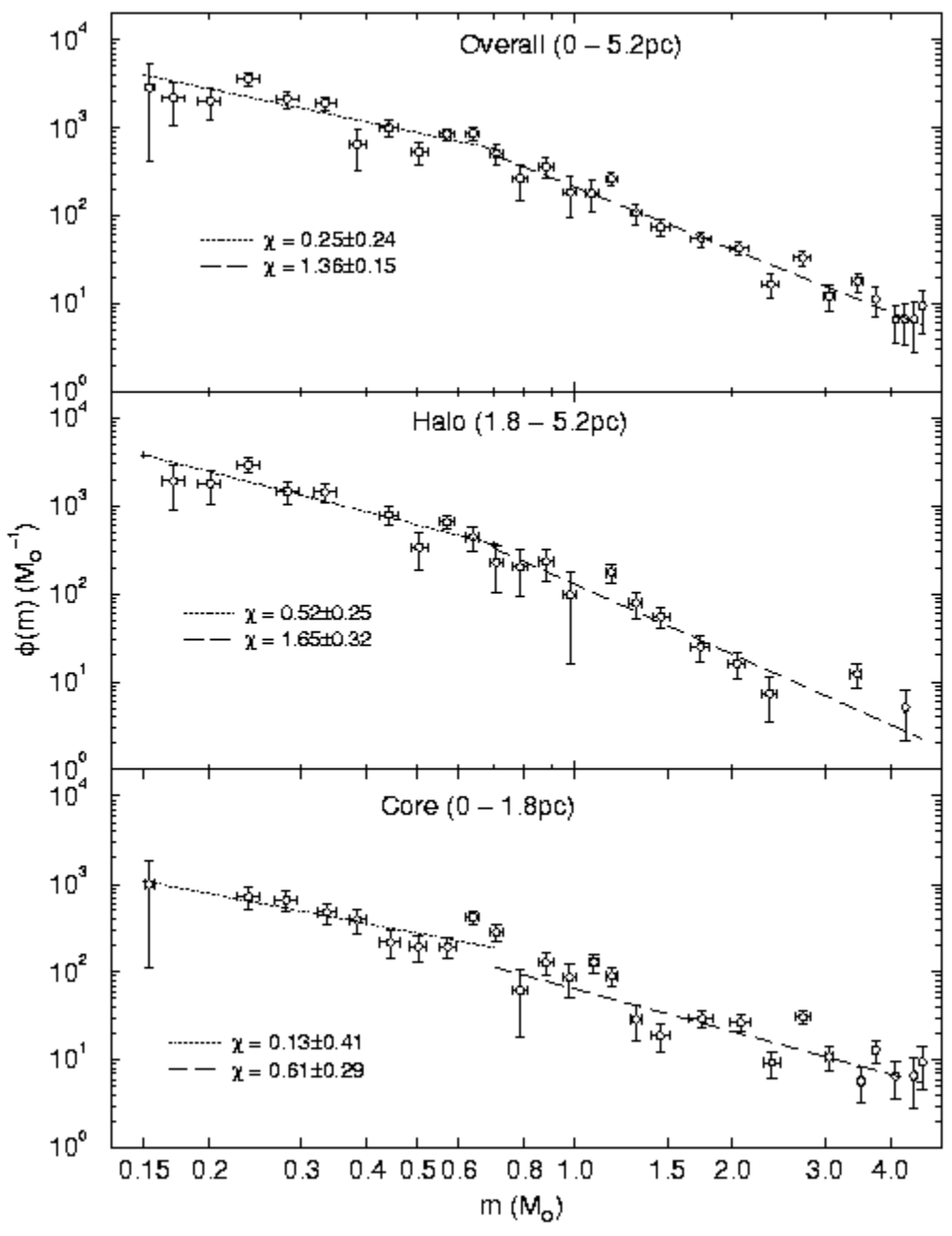
Perfis de densidade (numéricos) radial: estrutura espacial de aglomerados.



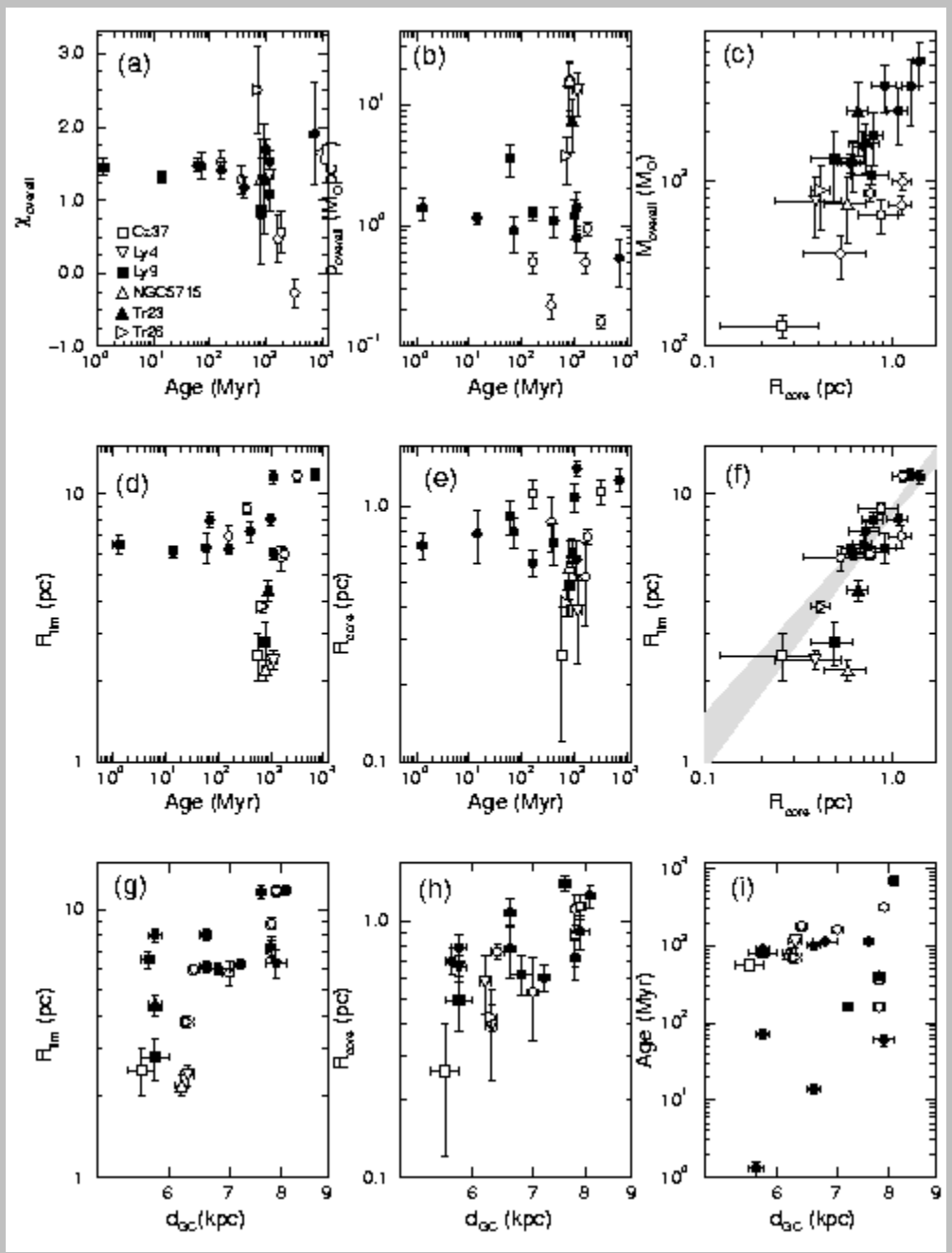
Perfis de densidade radial (massa).



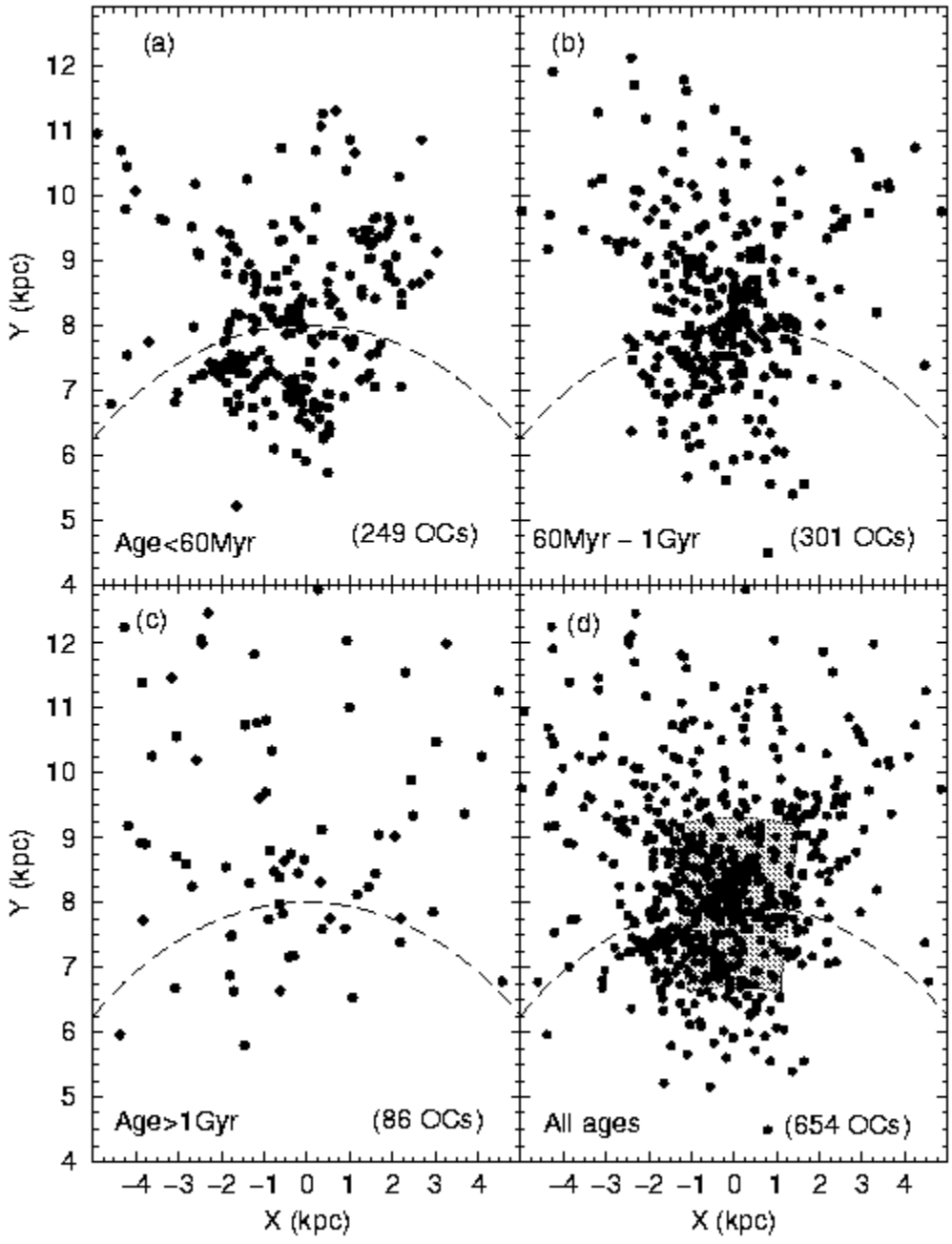
Estado dinâmico a partir de funções de massa.



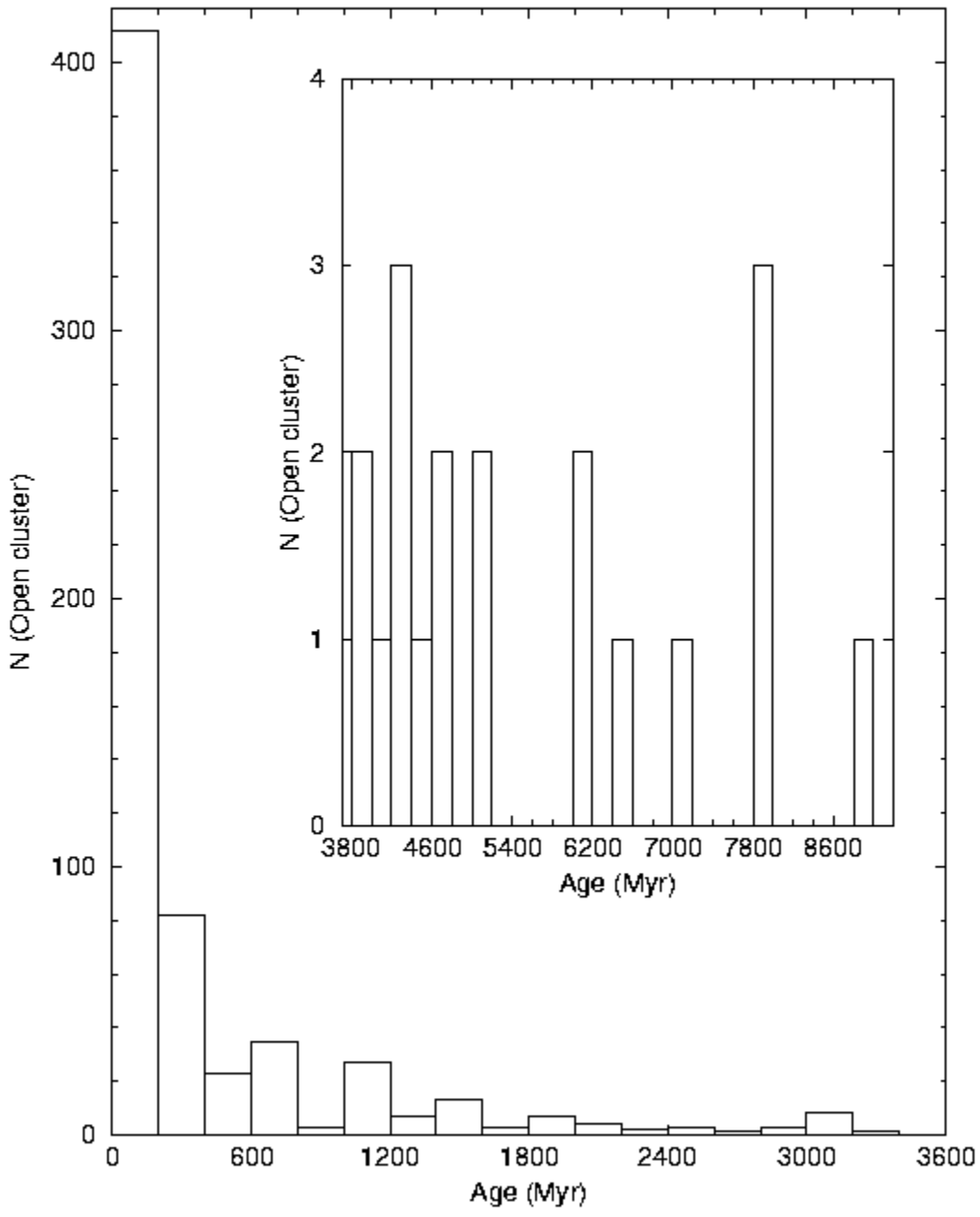
Estado dinâmico a partir de diagramas-diagnóstico.



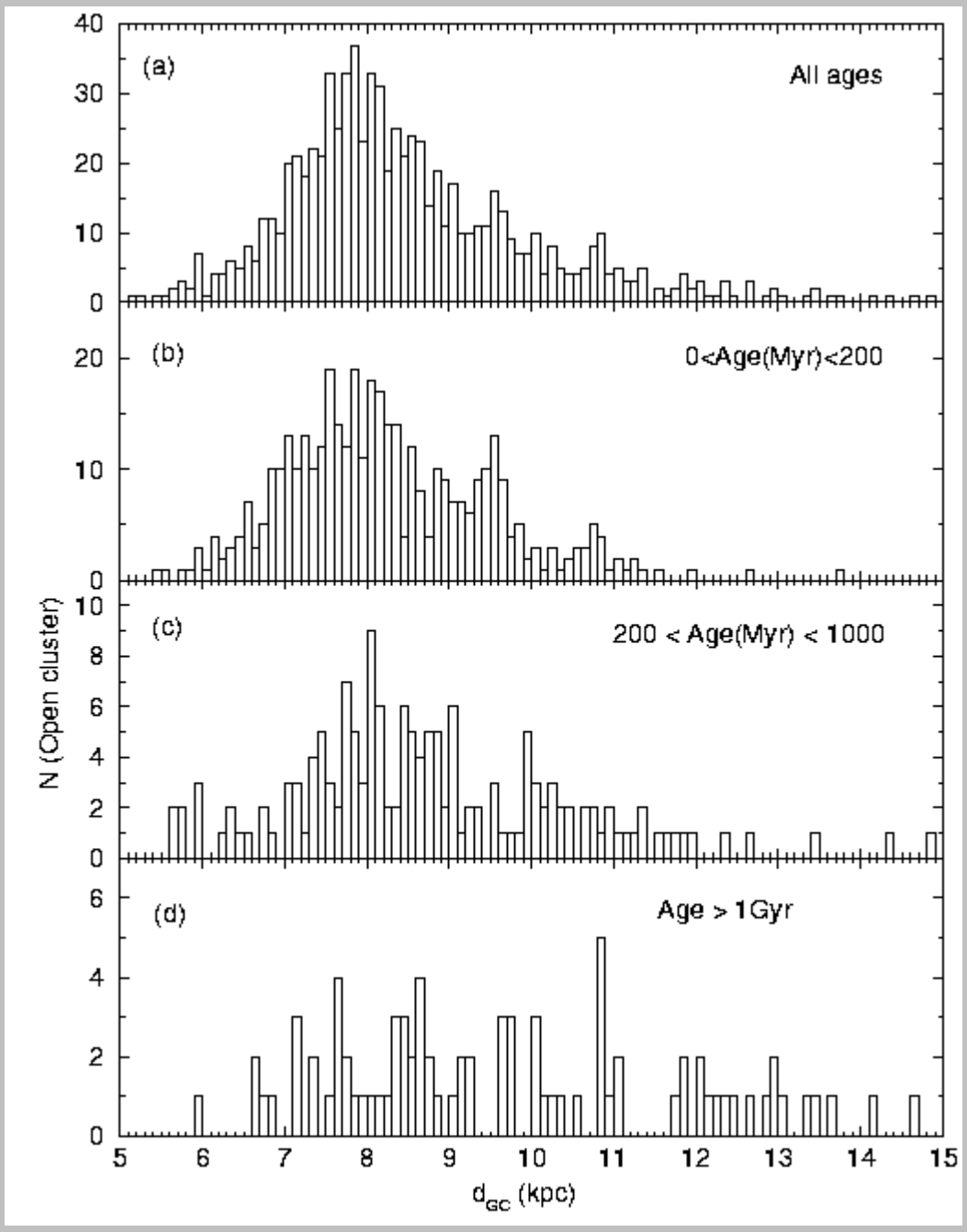
Aglomerados abertos projetados no plano Galáctico



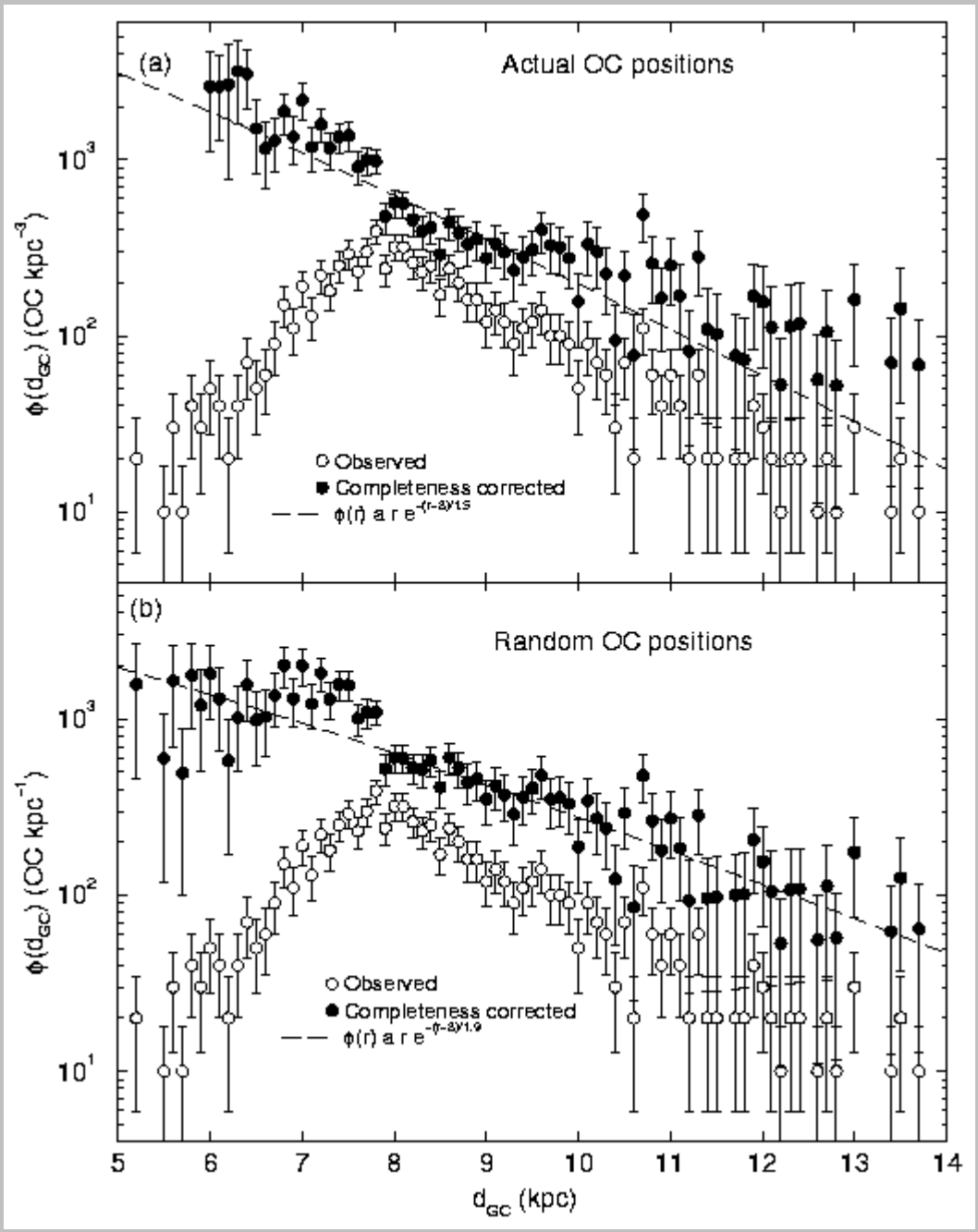
Distribuição de idades



Distribuição em distância Galactocêntrica



Efeito de completeza



Função distribuição de idades – taxas de formação dependentes do tempo!